THE EXPLOSIVES ENGINEER

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Forerunner of Progress in Mining, Quarrying, Construction

A review of the results of the National Safety Competition of 1954, as reported by Seth T. Reese, chief of the Branch of Accident Analyses, Bureau of Mines, U. S. Department of the Interior, shows that five new records were established:

Lowest injury-frequency rate in the 30-year history of the competition.

Largest number of injury-free operations, representing 40 per cent of the 579 mines and quarries participating.

Smallest number of injuries, fatal and nonfatal, in any year since the competition was started in 1925.

Lowest injury-frequency and -severity rates ever recorded in the quarry group.

Highest enrollments in the metal, nonmetallic, and quarry group classifications.

The overall statistics reveal that the 579 mines and quarries enrolled in the 1954 contest represented a total operating time of 126,695,445 man-hours. Perfect records of no lost-time accidents were recorded at 97 mines — 16 coal, 8 metal, 25 nonmetallic, 48 open pits — and at 130 rock quarries. These 227 injury-free contestants reported a total worktime of 19,481,445 man-hours.

On the basis of the combined efforts of the 579 participants, located in 43 states throughout the nation, the results of the competition last year again proved its importance among the many methods devised by the U. S. Bureau of Mines to promote accident prevention in the mineral industry in the United States. The progressive reduction of lost-time injuries, and their ultimate elimination, is the goal of any well-conducted safety program. The records of the 1954 National Safety Competition demonstrate that such a goal can be accomplished by the mineral industry. The total number of injuries involving loss of worktime at competing mines was considerably lower than in any other year of the competition's 30-year history.

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By Kenneth N. Baker

Views and opinions expressed by the authors of articles in this publication are their own, and they do not necessarily represent those of the publisher.

Therefore, the obvious conclusion is that had the management of all mines and quarries producing minerals in the United States succeeded in preventing lost-time accidents as well as those enrolled in the 1954 National Safety Competition, many lives would have been saved and numerous injuries prevented.

Each of the six winning operations is awarded a bronze Sentinels of Safety trophy and a green-and-white flag, provided by The Explosives Engineer, and engraved Certificates of Achievement in Safety, provided by the Bureau of Mines. In addition to the six top awards, all mines and quarries that had perfect records during 30,000 or more man-hours of work receive certificates from the Bureau.

Please turn to page 102.

• • •

Because of the steady increase in the costs of stripping 40-ft. of overburden covering the quarry face, and long truck hauls from the face to the crusher, Bryan Rock and Sand Company decided to deepen the quarry floor in its Neverson quarry at Bailey, North Carolina, and establish a new working face.

The first blast in the floor of the quarry involved the firing of 112 well-drill holes loaded with 22,900 lb. of Hercules dynamite, in an area 150 ft. long and 60 ft. wide. Results from the blast were excellent. The company's plans for a new working face averaging 30 ft. deep were realized.

More details will be found on page 121.

• • •

Erratum: In our May-June, 1955, issue, the caption under the illustration at the lower left of page 86 reads, in part, "850 *lb.* of salt per blast." This should have read "850 *tons* of salt per blast."

We regret that this error was not detected before the issue was printed.

DRILLING COSTS CUT IN HALF with this JOY TRAC-DRILL

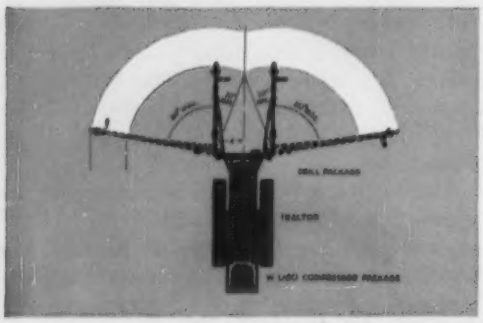
56%, TO BE EXACT was this contractor's reduction in drilling costs on his Missouri highway job, with the Joy Trac-Drill.

"STAY AHEAD OF THE SHOVELS," was the order. But *four* wagon drills driven by *two* compressors couldn't do it. Even with overtime . . . a long ten-hour day . . . the seven-man crew (four drillers, two helpers, one compressor operator) couldn't meet production.

A JOY TRAC-DRILL PACKAGE was mounted on a used tractor along with a Joy WL-80 Compressor Package. (Joy furnished complete instructions.) The rig worked like a charm. It easily led the shovels . . . and with only *four* men—two drillers, one helper and a tractor operator. The unit was completely self-contained and maneuverable. The B-I-G savings show up in the contractor's weekly cost figures:

	4 WAGON DRILLS	JOY TRAC-DRILL
Labor	$ 810	$500
Depreciation (3-yr.)	212	145
Fuel	140	86
Total	$1160	$730
Performance (week)	7200 ft.	10,200 ft.
Cost—foot of hole	16¢	7¢

THE TRAC-DRILL PACKAGE INCLUDES twin drills and feeds mounted on Joy Hydro Drill Jibs (hydraulically-actuated booms with power lift and power swing). Because the jibs are extensible, the Trac-Drill can reach out to put many holes in a straight line, if necessary, from one tractor setup. A used tractor, past its prime can thus be converted to an ace drilling machine. The whole story is in our Bulletin M-214, free for the asking. Just write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario*



Each Hydro Drill Jib on the Joy TRAC-DRILL operates in a 100° arc making it possible with extensible 10' Jibs to drill to a 42' width.

Consult a Joy Engineer

for AIR COMPRESSORS • ROCK DRILLS • WAGON DRILLS
CORE DRILLS • BLAST HOLE DRILLS • PORTABLE HOISTS • FANS
BLOWERS • TUNNEL, QUARRY, MINE EQUIPMENT

JOY

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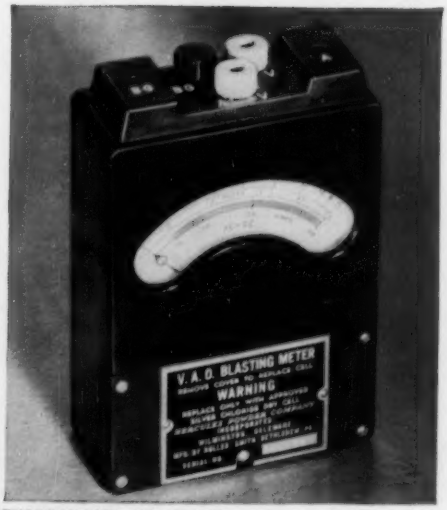
CONSTRUCTION EQUIPMENT MANUFACTURERS
FOR OVER HALF A CENTURY

HIGH CAPACITY, YET PORTABLE—The Titan Blaster is housed in a rugged aluminum case and is waterproof.

NEW HERCULES TITAN BLASTER



THREE-IN-ONE—The V.A.O. meter, available through Hercules, is a combination voltmeter, ammeter, and blasting galvanometer that has proved its value in field use as an important blasting aid.

For Maximum Safety, Economy

The Hercules Titan Blaster is a high-capacity, condenser discharge type of blaster that combines maximum safety with minimum maintenance expense.

The Titan Blaster has no moving parts. It is operated by depressing two push-button switches—one to charge and one to fire. This new Hercules blaster develops sufficient electrical energy to fire as many as 1,200 detonators. Yet, there is no high voltage associated with the Titan Blaster except during charge and firing. The source of energy is a relatively inexpensive 6 volt, dry cell ignition-type battery.

For full technical details on the Titan Blaster, write:

HERCULES POWDER COMPANY
INCORPORATED
Explosives Department, 990 King St., Wilmington 99, Del.

XBSS-7

JAMES C. GRAY

James C. Gray

VICE PRESIDENT — OPERATIONS — COAL

UNITED STATES STEEL CORPORATION

A Biography

THIRTY YEARS AGO, James C. Gray, a young, ambitious mining engineer just out of college, began his association with the mining and preparation of coal in Scranton, Pennsylvania. Since that time, his association with the coal industry has never been interrupted. Today, Mr. Gray is vice president in charge of coal operations of United States Steel Corporation, with headquarters in Pittsburgh, Pennsylvania.

His recognized abilities as an engineer and executive, added to his appreciation and understanding of his fellowmen, have won for him the respect and admiration of his associates in the coal-mining industry. Mr. Gray's career offers another example of the success that comes from continuous and energetic concentration in a chosen field.

Jim, as his friends and associates know him, was born in Elco, Washington County, Pennsylvania, June 28, 1904, the son of Alexander B. and Isabella C. Gray. His parents, of Scotch-English ancestry, were born in England. They came to the United States at an early age and settled in the Monongahela Valley of Pennsylvania, where, subsequently, they had a family of eleven children: six boys and five girls.

After completing the prescribed courses in the Elco grade school and the Charleroi High School, Jim went to Pennsylvania State University. He was graduated from the University in 1925 with a B.S. degree in mining engineering. During undergraduate days at Penn State, his extracurricular activities included memberships in the Student Council; the Inter-Fraternity Council; the Blue Key and Lion's Paw, honorary societies; and election to the vice presidency of the senior class.

Soon after graduating from the University, he went to work for Hudson Coal Company. During the next twelve years, he was advanced through various positions of responsibility, including the appointment as mine foreman of one of the company's anthracite collieries.

In 1937, Jim left Hudson Coal Company to become associated with the Tennessee Coal & Iron Division of United States Steel Corporation at Fairfield, Alabama, as superintendent of its Wylam mine. Three years later, he was promoted to the job of chief inspector of TCI's coal mines. In May, 1942, he was given additional responsibility by appointment to the position of superintendent of Industrial Relations, at the same time retaining his duties as chief inspector of the coal mines. The following year, he was moved up to the job of general superintendent of coal mines. In August, 1948, the TCI management promoted him to the position of assistant manager of Raw Materials and, two years later, he was appointed manager of the company's Manufacturing Operations.

In November, 1954, Jim was transferred to the home office headquarters of United States Steel Corporation to take over the duties of vice president — operations — coal, the position he holds today.

Mr. Gray has been active in professional and civic associations, including memberships on the Executive Committee of the American Institute of Mining and Metallurgical Engineers, and past chairman of its Southeast Section; the American Iron and Steel Institute; the Coal Mining Institute of America; the Advisory Council of the Coal Division of the American Mining Congress; and the Engineers' Society of Western Pennsylvania.

Jim married Edna Brotherton on September 21, 1929, in Wilkes-Barre, Pennsylvania. They have three children, two daughters and one son. The family home is at 5025 Fifth Avenue in Pittsburgh.

Mr. Gray's club affiliations include the Duquesne in Pittsburgh, the Engineers and the Birmingham Country in Birmingham, Alabama.

Obviously, Jim Gray is a hard worker, but it hasn't been all work by any means. When opportunity permits, this genial, soft-spoken man indulges his love of the outdoors, particularly in matching his skill on a golf course with a wide circle of friends.

THE WINNERS · 1954

Anthracite
No. 5 Hill Mine
Ploskonka Coal Company
Archbald, Pennsylvania

Bituminous-Coal
Labuco Mine
Alabama By-Products Corporation
Flat Creek, Alabama

Metal
Zenith Mine
Pickands Mather & Co.
Ely, Minnesota

Nonmetallic
No. 6 Mine
United States Gypsum Company
Plasterco, Virginia

Open-Pit
Mahoning Mine
Pickands Mather & Co.
Hibbing, Minnesota

Quarry
Thornton Quarry
Material Service Corporation
Thornton, Illinois

"Let the worker carry around with him a mental picture of his wife and child, whose happiness depends upon his safe return after the day's work, and these loved ones become his surest sentinels of safety."

January 1925 — The Explosives Engineer

THE National Safety Competition OF 1954

The records of 579 mines and quarries in 43 states, representing 126,695,445 man-hours of work last year, show the lowest injury-frequency rate in the 30-year history of the contest

SETH T. REESE*

For 30 years, the National Safety Competition has proved to be highly effective as a medium for the promotion of safety among the mines and quarries in the United States. Inaugurated in 1925 by the Bureau of Mines, U. S. Department of the Interior, in cooperation with THE EXPLOSIVES ENGINEER, this annual contest has produced notable achievements year after year. Progress, however, has not been uninterrupted. There have been instances where the injury-frequency or injury-severity rates, either or both, for a given year, were higher than the year immediately preceding. But, in reviewing the overall picture, the injury rates since 1925 show an appreciably and gratifyingly downward trend.

The 1954 competition resulted in a combined frequency rate of 21.713 injuries per million man-hours for the 579 competing companies. This was the lowest rate recorded to date during the 30-year history of the contest. The injury-severity rate of 4.869 days per thousand man-hours, while slightly less favorable than the previous year, was the second lowest rate recorded since the competition was started.

Other Outstanding Achievements

The contest in 1954 revealed other outstanding achievements that merit special mention. The number of injury-free mines and quarries was 227, approximately 40 per cent of the total number enrolled. This was a record high. These injury-free plants were operated for a total of 19,481,445 man-hours, the second largest total of injury-free worktime in the history of the competition. In the quarry group, 235 operations established new low injury-frequency and injury-severity rates. The rate of occurrence of injuries at 93 bituminous-coal mines was the second lowest ever recorded.

On the basis of the combined efforts of all 579 participants, the results of the 1954 competition again proved its importance among the many methods devised by the Bureau of Mines to promote accident prevention in the mineral industries in the United States. The progressive reduction of injuries, and their ultimate elimination, is the aim of any well-established and well-conducted safety program. The results of the competition in 1954 prove that, as far as the mineral industry is concerned, such a goal can be accomplished. The total number of lost-time injuries at competing mines was considerably lower than in any other year in the competition's history. Therefore, it must be concluded that had the management of all mines and stone quarries producing minerals in the United States succeeded in preventing lost-time accidents as well as those enrolled in the 1954 National Safety Competition, many lives would have been saved and numerous injuries prevented.

The statistics show that the 579 companies enrolled in the contest in 1954 were operated 126,695,445 man-hours. Perfect records of no lost-time injuries were recorded at 97 mines – 16 coal, 8 metal, 25 nonmetal, and 48 open pits – and at 130 quarries. These represent 227 perfect records in accident prevention. The employes, supervisors,

*Chief, Branch of Accident Analyses, Division of Safety, Bureau of Mines, U. S. Department of the Interior

ANTHRACITE'S NO. 5 HILL MINERS: A group of employes at No. 5 Hill mine of Ploskonka Coal Company are photographed in front of one of the surface structures at Archbald, Pennsylvania.

and management personnel at these mines and quarries deserve the highest praise for their splendid teamwork in adopting and carrying out efficient programs for the promotion of safety.

The Winners

The mines and quarries with the winning records in the National Safety Competition for the year 1954 are:

Anthracite mines, underground: No. 5 Hill mine, Ploskonka Coal Company, Archbald, Lackawanna County, Pennsylvania.

Bituminous-coal mines, underground: Labuco mine, Alabama By-Products Corporation, Flat Creek, Walker County, Alabama.

OPERATING STAFF: The operating staff at No. 5 Hill mine includes, left to right, Edward Kearney, maintenance supervisor; Joseph Ploskonka, assistant mine foreman; Louis Ploskonka, operator; Sebastian Kleinbauer, assistant mine foreman; and Edward Ford, mine foreman.

Metal mines, underground: Zenith mine, Pickands Mather & Co., Ely, St. Louis County, Minnesota.

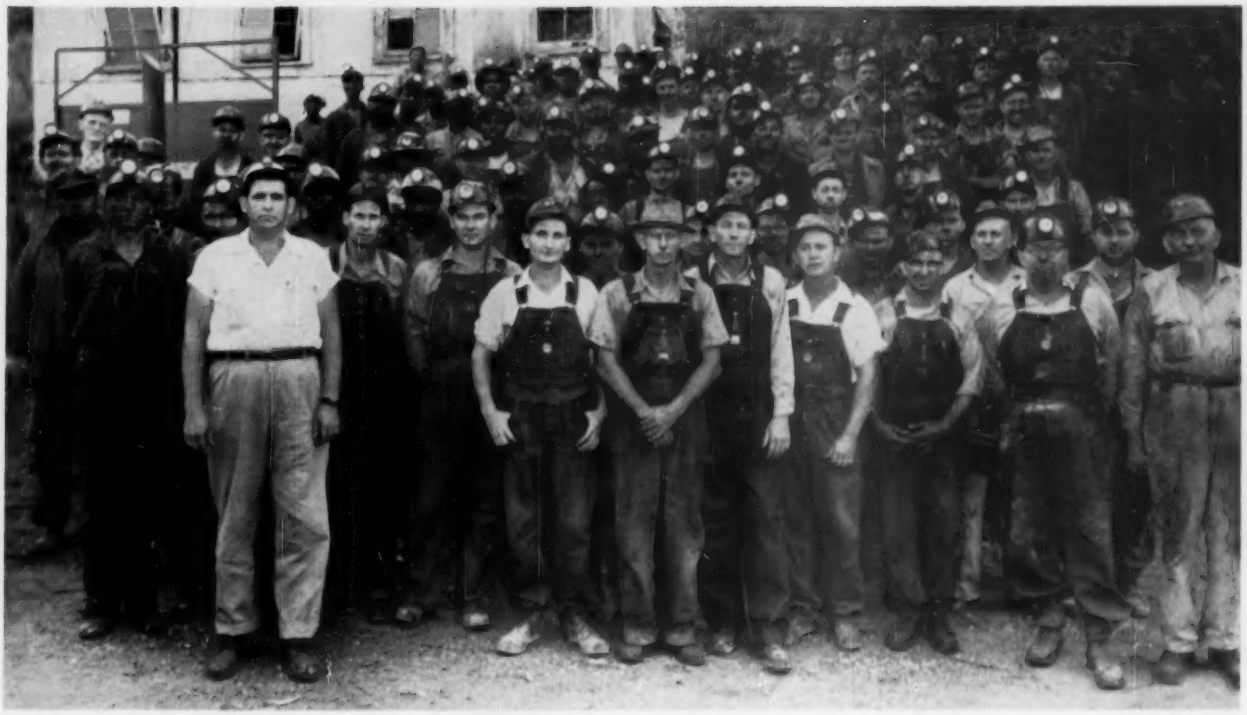
Nonmetallic mines, underground: No. 6 mine, United States Gypsum Company, Plasterco, Washington County, Virginia.

Open-pit mines: Mahoning mine, Pickands Mather & Co., Hibbing, St. Louis County, Minnesota.

Quarries: Thornton quarry, Material Service Corporation, Thornton, Cook County, Illinois.

Awards to the Winners

Each winner among the competing companies is awarded a bronze Sentinels of Safety trophy provided by THE EXPLOSIVES ENGINEER. The trophies are awarded annually to the winner in each of six group classifications in the competition. These six groups include four kinds of underground mines — anthracite, bituminous-coal, metal, and nonmetallic minerals — and two classes of surface operations — open-pit mines, regardless of the kind of mineral produced, and quarries, regardless of the kind of stone produced. The winner in each of the six groups is the mine or quarry that was operated during a contest year with the smallest number of lost-time injuries to em-



THE LABUCO MINERS: The employes of the Labuco mine of Alabama By-Products Corporation, Flat Creek, Alabama, made a perfect safety record during 109,955 man-hours of work underground last year.

ployes in proportion to the number of man-hours worked by all employes at the mine, open pit, or quarry. When two or more participating operations are injury-free, or their injury-severity rates are identical during a contest year, the winner is that one whose total operating time covered the largest number of man-hours.

In addition to the bronze trophies, THE EXPLOSIVES ENGINEER provides Sentinels of Safety flags for presentation to the six winning operations. These flags, flown over or displayed on the properties of the winning plants, serve as daily reminders to the employes at these mines and quarries of what has been accomplished. They also help to remind others of what can be accomplished in creating safe working conditions.

For the part played by employes and company officials in making possible these outstanding safety records, each man is awarded a Certificate of Achievement in Safety by the Bureau of Mines. The mines and quarries ranking second, third, fourth, and fifth in their respective groups are also awarded certificates by the Bureau. (See page 118.) Certificates are also

DIRECTORS OF OPERATIONS: Labuco mine's operating directors are, seated left to right, G. L. Snyder, section foreman; O. L. Kuglar, master mechanic; P. H. Word, safety director; G. D. Sparks, mine superintendent; F. L. Glaze, mine foreman; J. E. Maxwell, section foreman. Standing, left to right, Hollis Cunningham, section foreman; C. V. Atkinson, section foreman; W. L. Roy, Jr., cashier; Sam Kemeys, materials foreman.

TYPICAL CONVEYOR BELT: This 30-in. conveyor belt in an entry in the Labuco mine is typical of the method used for the haulage of coal mined underground.

SURFACE TROLLEY YARD: The Labuco miners are brought out of the underground workings in the mine to the trolley yard on the surface in cars hauled by electric locomotives.

LABUCO'S PREPARATION PLANT: The coal from the Labuco mine is washed and made ready for commercial uses in Alabama By-Products Corporation's modern preparation plant at Praco, Alabama.

awarded to each participant whose operating time covered 30,000 or more man-hours without a lost-time injury.

Anthracite Mines

The winner in the anthracite group was No. 5 Hill mine at Archbald, Lackawanna County, Pennsylvania, operated by Ploskonka Coal Company, with a record of 72,405 man-hours of operations underground, during which time three injuries occurred that resulted in a loss of 8 work days. Its injury-severity rate for 1954 was 0.11 per one thousand man-hours of work, with an injury-frequency rate of 41.43 per one million man-hours.

This is the second time No. 5 Hill mine has won top honors in the anthracite classification. It was enrolled in the competition for the first time in 1950. The following year it had the best safety record among all the competing mines producing anthracite. Its second victory in the 1954 contest attests to the determination of each miner and supervisor to practice safety in his work each day.

During the five years that No. 5 Hill mine has been a participant in the competition, 17 injuries have occurred during 359,069 man-hours of worktime. This record represents an injury-frequency rate of 47.34 per million man-hours, considerably lower than the overall rate established by the anthracite group during the 30-year history of the contest.

As a group, the 27 anthracite mines participating in 1954 had an injury-frequency rate of 76.126 injuries per million man-hours. This was slightly higher than the 1953 figure. However, it was lower in only four of the previous 29 years of the competition.

Bituminous-Coal Mines

Among the 93 bituminous-coal mines enrolled in the competition last year, the winner of the Sentinels of Safety trophy was the Labuco mine of Alabama By-Products Corporation at Flat Creek, Walker County, Alabama. This mine had a perfect record of no lost-time injuries during a total of 109,955 man-hours of operations underground through the year. Labuco mine's record of no lost-time injuries in 1954 is an outstanding accomplishment in the history of the United States

ZENITH MINE EMPLOYES: The men of Pickands Mather's Zenith mine at Ely, Minnesota, won the Sentinels of Safety trophy in the metal group classification with a record of 501,160 man-hours during 1954 and no lost-time injuries.

bituminous-coal-mining industry.

This mine in Alabama has participated in the National Safety Competition for 17 years. The award of the Sentinels of Safety trophy for 1954 was the first time it won this national honor. However, its safety record during this period has been noteworthy — in 15 of the 17 years it has been operated without a fatality during 4,434,946 man-hours of worktime. The persistence of the employes of this mine in carrying on their work underground with safety uppermost in mind has earned for them the well-deserved distinction of winning top honors for 1954 in their group.

The 93 bituminous-coal mines enrolled in the competition last year were operated for approximately 46 million man-hours. The injury-frequency rate of 18.890 per million man-hours was better in only one year (1953) since the competition began in 1925. The group's severity rate of 6.211 per thousand man-hours of exposure was the fourth lowest rate recorded for the industry in the history of the competition.

Metal Mines

First honors among underground metal mines enrolled in the contest were won by the Zenith iron-ore mine of Pickands Mather & Co. at Ely, St. Louis County, Minnesota. The employes at this mine worked 501,160 man-hours during 1954 with no lost-time injuries. Its winning first place among the 66 metal mines enrolled in

ZENITH'S SUPERVISORS: The supervisory force at Zenith mine includes, left to right, seated, John Kotchevar, Carlo Buraglio, H. F. McFarland, B. S. Richards, C. J. Miron, Charles Matson. Standing, left to right, are John Chelesnik, John Labernik, Louis Benko, Mike Klobuchar, Urho Niemi, John Miklaucich, John Simonich, Joe Grahek, and Stanley Kent.

ACCIDENT-PREVENTION AIDS: In the Zenith mine of Pickands Mather & Co. at Ely, Minnesota, reflector signs are placed in underground workings to aid in the prevention of fall-of-ground accidents.

1954 brought the Sentinels of Safety trophy to the Zenith mine for the second time; the previous award was in the 1935 competition. It also was awarded an honorable mention certificate for an excellent safety record in 1933.

The Zenith mine was enrolled in the contest for the first time in 1930. During 25 years of participation, this plant has been operated 11.3 million man-hours. During this period, its injury-frequency rate has been 13.323 per million man-hours, with an injury-severity rate of 4.399. Each rate is well below the respective average rate for all mines competing in this group for the 30-year period of the contest.

The overall safety performance at the 66 metal mines participating (a new high record enrollment) was a frequency rate of 32.914 injuries per million man-hours of worktime, the lowest rate recorded since 1951. The severity rate of 5.865 was lower in only four of the previous 29 years of the National Safety Competition.

ZENITH'S SURFACE STRUCTURES: The spic-and-span surface buildings and grounds at the Zenith mine are indicative of the good housekeeping practiced at all operations of Pickands Mather & Co.

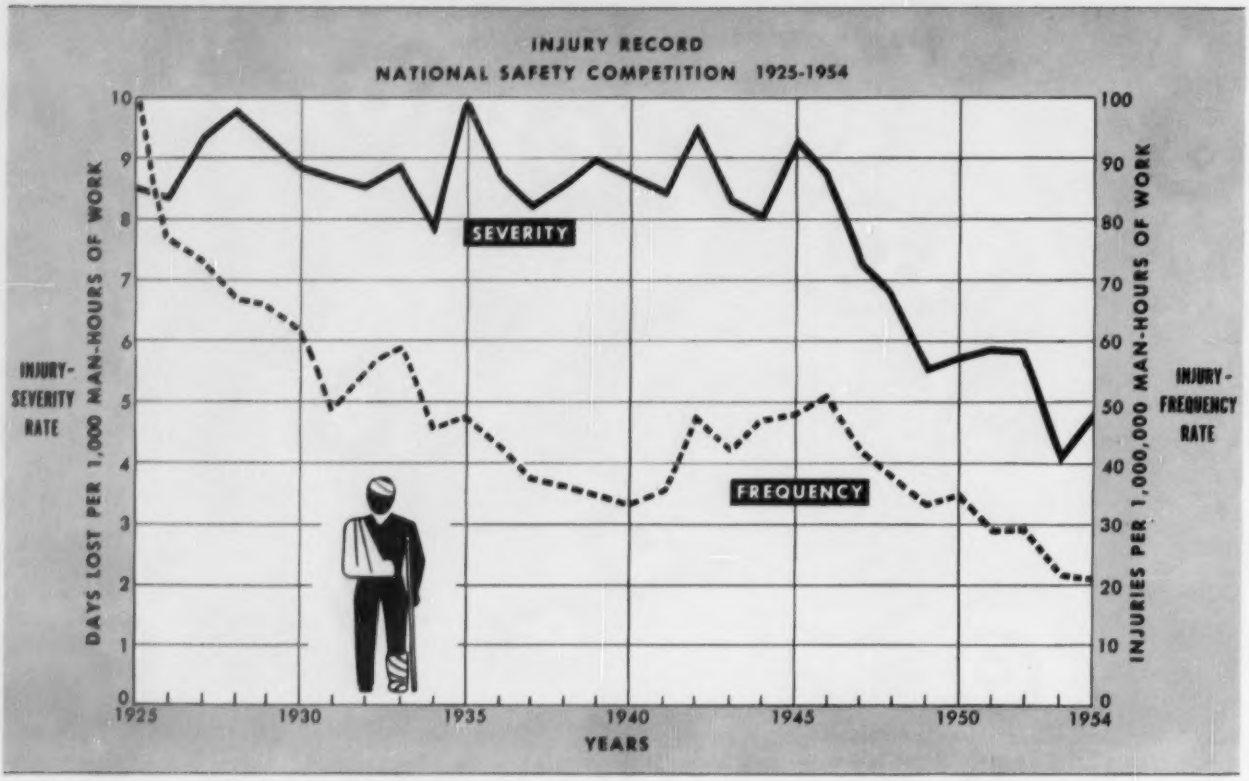
U. S. GYPSUM'S NO. 6 MINE CREW: The employes of United States Gypsum Company's No. 6 mine at Plasterco, Virginia, winners in the nonmetallic mine classification, gather near the shaft collar of the mine to have their picture taken.

Nonmetallic Mines

First place among the mines producing nonmetallic minerals was won by No. 6 mine of United States Gypsum Company, at Plasterco, Washington County, Virginia, with a perfect safety record in 1954 during a total of 334,244 man-hours of work. The excellence of this injury-free record is apparent when compared with the combined rate for all 58 mines (a record high) that were enrolled in this classification. As a whole, the group had an injury-frequency rate of 19.743 and an injury-severity rate of 2.196.

No. 6 mine is one of many long-time participants in the National Safety Competition. It was enrolled in the contest for the first time in 1930, and has continued to compete without interruption since then. During the first three years of this 25-year period of enrollment, this mine was awarded certificates of honorable mention. It was similarly honored in 1939 and in 1940. It won its first Sentinels of Safety trophy in 1941 and the second in 1943. The 25-year record of No. 6 mine reveals 6,104,398 man-hours worked with 47 lost-time injuries and 8,471 days of disability. This record repre-

UNDERGROUND CONFERENCE: Lucas Lawrence, sixth-level foreman, at left, reviews plans for operating procedure in No. 6 mine with E. M. des Rochers, engineering superintendent; Donald C. Smith, mine engineer; Ryan C. McNamee, mine superintendent; and Dave R. Davis, mine foreman.



SALIENT FEATURES OF THE NATIONAL SAFETY COMPETITION
1954

Type of Mine	*Number of Mines*	*Man-hours*	*Fatal Injuries*	*Nonfatal Injuries*	*Total*	*Days of Disability*	*Frequency Rate*	*Severity Rate*
Anthracite	27	7,185,433	10	537	547	101,162	76.126	14.079
Bituminous-coal	93	45,633,572	30	832	862	283,433	18.890	6.211
Metal	66	22,665,131	13	733	746	132,935	32.914	5.865
Nonmetallic mineral	58	8,256,045	2	161	163	18,134	19.743	2.196
Total	244	83,740,181	55	2,263	2,318	535,664	27.681	6.397
Open-pit	100	20,468,250	4	191	195	38,460	9.527	1.879
Quarries	235	22,487,014	4	234	238	42,776	10.584	1.902
Grand Total	579	126,695,445	63	2,688	2,751	616,900	21.713	4.869

THE 30-YEAR HISTORY OF THE NATIONAL SAFETY COMPETITION
1925 - 1954

Type of Mine	*Man-hours*	*Fatal Injuries*	*Nonfatal Injuries*	*Total*	*Days of Disability*	*Frequency Rate*	*Severity Rate*
Anthracite	652,146,052	769	56,926	57,695	6,803,524	88.469	10.433
Bituminous-coal	1,410,286,130	1,399	60,125	61,524	13,283,306	43.625	9.419
Metal	537,747,712	426	18,745	19,171	3,735,186	35.651	6.946
Nonmetallic mineral	136,116,001	85	3,806	3,891	750,519	28.586	5.514
Total	2,736,295,895	2,679	139,602	142,281	24,572,535	51.998	8.980
Open-pit	329,609,575	94	5,300	5,394	923,344	16.365	2.801
Quarries	502,622,711	241	9,544	9,785	2,182,005	19.468	4.341
Grand Total	3,568,528,181	3,014	154,446	157,460	27,677,884	44.123	7.756

sents a frequency rate of 7.699 and a severity rate of 1.388, an excellent accomplishment over a long period.

Open-Pit Mines

In the open-pit group, the winner of the Sentinels of Safety trophy was the Mahoning iron-ore mine of Pickands Mather & Co., at Hibbing, St. Louis County, Minnesota. This mine had no lost-time injuries in 1954 during an operating time involving 527,355 man-hours of work.

Mahoning mine was first enrolled in the National Safety Competition in 1930, and has been an active participant ever since. On six occasions — 1932, 1934, 1935, 1946, 1949, and 1950 — it was awarded certificates of honorable mention. In 15 of its 25 years in the contest, Mahoning mine has had no lost-time injuries. Its victory in the 1954 competition marks the ninth time that the mine has won the Sentinels of Safety trophy.

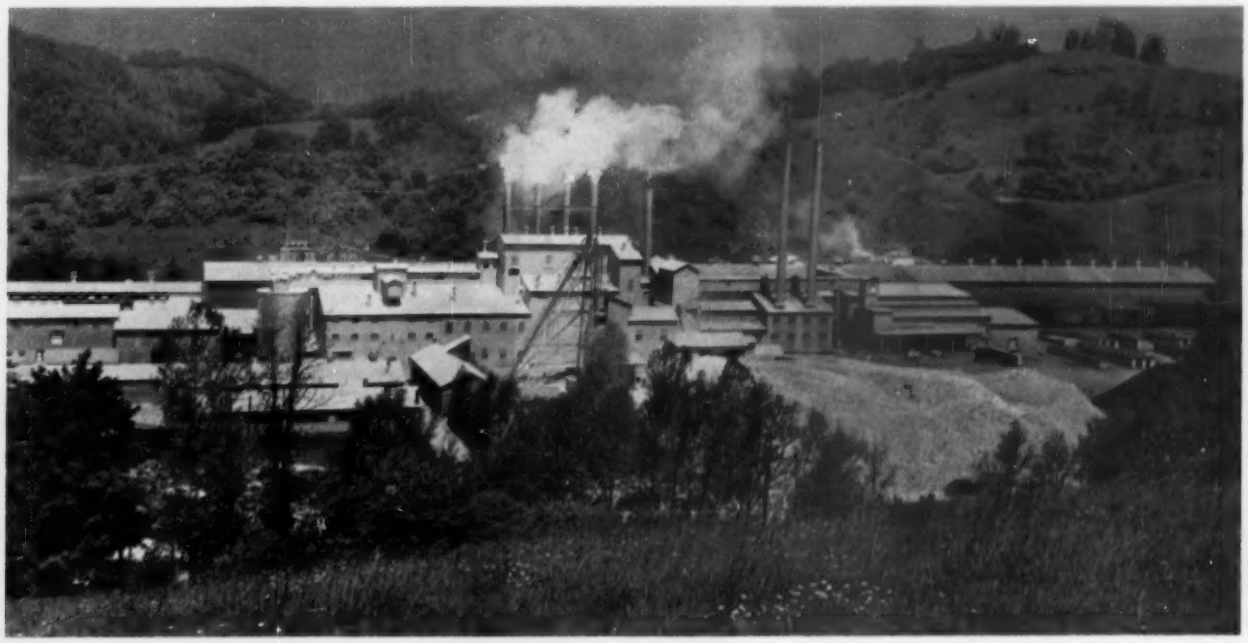
During its 15 injury-free years, Mahoning mine was operated 6,056,776 man-hours. During the entire 25-year period of its enrollment, the volume of work totaled 10,825,728 man-hours, with an injury-frequency rate of 1.386 and an injury-severity rate of 2.306. This is a record to make all of the mine employes and company officials proud.

LOADING GYPSUM ROCK: After a blast in U. S. Gypsum's No. 6 mine, broken gypsum rock is loaded into mine cars by a mounted three-drum slusher hoist.

Quarries

Among the 235 stone quarries (a new record high enrollment) that participated in the 1954 National Safety Competition, the winner was the Thornton limestone quarry of Material Service Corporation, at Thornton, Cook County, Illinois. This quarry had a perfect safety record last year — no lost-time injuries during an operating time of 457,570 man-hours. Its injury-free record won top honors and the award of the Sentinels of Safety trophy. This victory was particularly noteworthy since it was the first year of Thornton quarry's participation in this nation-wide safety contest.

The awards of the bronze trophy to the quarry and the individual Certificates of Achievement in Safety to each employe and official pay tribute to the workmen and the management per-



PLANT AT PLASTERCO: This view of the plant buildings at Plasterco, Virginia, shows the shaft collar and headframe in foreground; the shops at left; the gypsum stockpile at right; and the sheet rock plant in the background.

THE MAHONING OPEN PIT: This on-the-job picture of a train of railroad cars being loaded with iron ore was taken at the Mahoning open-pit mine of Pickands Mather & Co. at Hibbing, Minnesota.

MAHONING MINE SUPERVISORS: Attending a discussion meeting on safety at Mahoning mine are, seated left to right, Charles Smith, William O'Connor, Harold Rutherford, Chester Johnson. Standing, left to right, are Superintendent W. D. Webb, Ernie Styles, James Greenaway, Joseph Parise, John Wiehe, Thomas Fields, Francis Kinzel, Edwin Stavnes, John Ban, and Fred Prtini.

sonnel for carrying through an efficient program of safety, which made possible this outstanding accomplishment in accident prevention.

The figures for the quarry group as a whole revealed an injury-frequency of 10.584 and an injury-severity rate of 1.902. Each of these rates bettered all previous records in this classification during the 30-year history of the competition.

Perfect Records

As indicated previously, perfect records of operating without a lost-time injury were made by 227 mines and quarries, or approximately 40 per cent of the total number enrolled in the 1954 contest. This established a new all-time record for the greatest number of injury-free contestants. The plants with perfect records were operated for a total of 19,481,445 man-hours, the second largest injury-free worktime in the history of the National Safety Competition. The no lost-time accident records were reported in the following group classifications: anthracite, 2;

BRIEFING TRUCK DRIVERS: Before the start of a shift at the Mahoning mine, a supervisor gives instructions to a crew of truck drivers concerning the plan of operations for the day.

bituminous-coal, 14; metal, 8; nonmetallic, 25; open pit, 48; quarry, 130.

The records also show that the quarry group, with 55.3 per cent of its enrollment injury free, led all other groups in unit achievement. The open-pit group with 48 per cent was second. Third place went to the nonmetallic group, with 43.1 per cent. The bituminous-coal, metal, and anthracite groups recorded 15, 12.3, and 7.4 per cent, respectively.

Included in the total of 227 injury-free operations are 53 mines and quarries that were operated less than 30,000 man-hours, the minimum worktime requirement for eligibility in winning the Sentinels of Safety trophy and the certificate awards. These plants are heartily commended for entering and continuing in the contest year after year despite the fact that they realized they were ineligible for top honors awards. Their reward is the personal satisfaction of each employe, supervisor, and owner in cooperating to the fullest extent to help his mine or quarry make a perfect safety record. By so doing, he makes a contribution to the mineral industry as a whole in its program of eliminating lost-time injuries in our mines and quarries.

A Summary of Results

The widespread interest in the National Safety Competition is indicated by last year's enrollment of 579 mines and quarries located in 43 states throughout the country. A brief summary of some of the outstanding accomplishments of the contest in 1954 reveals the following facts:

1. The injury-frequency rate of 21.713 per million man-hours of employe exposure to hazards was the lowest rate recorded in the 30-year history of the competition.

2. The injury-severity rate of 4.869 was the second lowest rate recorded.

3. The number of injury-free plants was a record high.

4. The number of injuries, fatal and nonfatal, was smaller in 1954 than in any other year of the competition.

5. The total of injury-free man-hours of work was the second highest since the start of the contest in 1925.

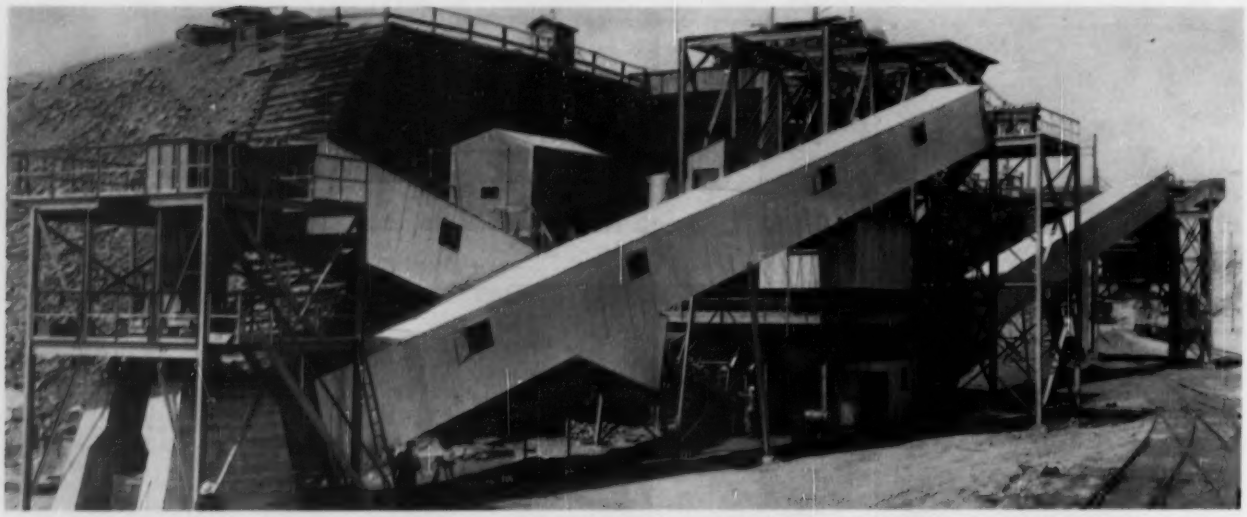
6. New low injury-frequency and injury-severity rates were established in the quarry group.

7. The injury-frequency rate in the bituminous-coal group was the second lowest rate on record.

8. New record high enrollments were recorded in the metal, nonmetallic, and quarry groups.

The Committee of Award

The National Safety Competition is conducted under specific rules. These rules were made specific so that participating companies could determine for themselves the degree of success of their efforts to attain top honors in the contest. Also, they facilitate comparison with past performances of their operations and with the safety records of industry as a whole. To merit the confidence of enrolled companies in the impartiality attending the conduct of the competition, the rules provide for a Committee of Award. At the close of the contest each year, a summary of the records covering man-



MAHONING'S PLANT: The iron ore mined at Pickands Mather's Mahoning open pit is processed for shipment to the trade through an up-to-date crushing plant and loading pocket.

THORNTON QUARRY MILL CREW: The mill crew at the Thornton quarry of Material Service Corporation, Thornton, Illinois, is photographed in front of an enclosed conveyor in the background that leads from the primary crusher to the mill building.

SAFETY MEETING: Thornton quarry's safety committee members meet each week for general discussions. Seated above, left to right, are John Stalman, yard foreman; John Gulich, assistant quarry foreman; Jim Christ, office manager; M. Jamicich, quarry foreman; Edward Schwartz, quarry superintendent; Manuel Martinez, labor foreman; and Arvid Tienson, safety director. Standing, left to right, are Al Roth, machine shop foreman; Arnold Kahler, maintenance foreman; W. Billingsley, electrical foreman; and Gus Snare, mill foreman.

hours and injuries at each of the five leading contenders in each of the six group classifications is submitted to this award committee.

Seven men, nationally known for their interest in promoting safety, but not connected with the Bureau of Mines, comprised the Committee of Award for the 1954 competition: Ned Dearborn, president, National Safety Council; Charles Ferguson, director, Safety Division, United Mine Workers of America; Howard I. Young, president, American Mining Congress; A. T. Goldbeck, engineering director, National Crushed Stone Association, Inc.; G. Donald Kennedy, president, Portland Cement Association; L. C. Campbell, president, National Coal Association; and H. DeWitt Smith, president, American Institute of Mining and Metallurgical Engineers.

A majority vote of the seven-man committee determines the six winners of the Sentinels of Safety trophies. With but few exceptions during the past 30 years, the votes of the committee have been unanimous.

Rules of the Competition

Any underground mine, quarry, or open-pit operation in the United States is eligible to enroll in the National Safety Competition. Applications for enrollment and copies of the contest rules may be obtained by communicating with the Bureau of Mines, Branch of Accident Analyses, Division of Safety, Washington 25, D. C. To main-

AT THE QUARRY FACE: While one of Thornton quarry's 5½-cu. yd. electric shovels loads blasted limestone into a 30-ton truck, a bulldozer keeps the floor clean and removes spilled materials from the roadway to the mill.

tain eligibility for the Sentinels of Safety trophies, the mines and quarries must have been operated not less than 100 days, and have a total worktime of not less than 30,000 man-hours in underground, quarry, or open-pit workings during the contest year. A designated official at each plant must agree to furnish a report of each lost-time or disabling injury and certain employment data to the Bureau of Mines at stated intervals. Each injury that results in temporary disability is charged with the number of days that the injured employe is away from work, including Sundays, holidays, and all other days, whether the plant was active or idle. Each death or permanent total injury is charged with 6,000 days. The various charges for permanent partial disabilities are listed in a detailed set of rules which is sent to each operation that enrolls in the competition.

At the close of each annual contest, the determined severity rate and a summary of the basic figures from which the rate is derived are submitted to each enrolled establishment for certification as to the accuracy and completeness of the original data furnished by the company to the Bureau.

EN ROUTE TO THE CRUSHER: Thirty-ton-capacity trucks loaded with dolomitic limestone from the Thornton quarry pass through a tunnel under a highway to make deliveries to the primary crusher.

ALL-TIME WINNERS

ANTHRACITE

1925—Hazle Brook Coal Company, *Upper Lehigh Mine*, Upper Lehigh, Pa.
1926—Jeddo-Highland Coal Company, *Highland No. 6 Mine*, Jeddo, Pa.
1927—Jeddo-Highland Coal Company, *Highland No. 6 Mine*, Jeddo, Pa.
1928—Jeddo-Highland Coal Company, *Highland No. 7 Mine*, Jeddo, Pa.
1929—Jeddo-Highland Coal Company, *Highland No. 6 Mine*, Jeddo, Pa.
1930—Coxe Brothers & Company, Inc., *Tomhicken Mine*, Jeddo, Pa.
1931—Jeddo-Highland Coal Company, *Highland No. 2 Mine*, Jeddo, Pa.
1932—Jeddo-Highland Coal Company, *Highland No. 7 Mine*, Jeddo, Pa.
1933—The Hudson Coal Company, *Stillwater Mine*, Vandling, Pa.
1934—Harleigh-Brookwood Coal Company, *Laurence Mine*, Mahanoy Plane, Pa.
1935—Jeddo-Highland Coal Company, *Jeddo No. 7 Mine*, Harleigh, Pa.
1936—Hazle Brook Coal Company, *Raven Run Mine*, Raven Run, Pa.
1937—Jeddo-Highland Coal Company, *Jeddo No. 7 Mine*, Harleigh, Pa.
1938—Colonial Colliery Company, *Greenough Mine*, Natalie, Pa.
1939—The Hudson Coal Company, *Eddy Creek Mine*, Olyphant, Pa.
1940—Hazle Brook Coal Company, *Midvalley Mine*, Wilburton, Pa.
1941—Eddie & Joe Coal Company, *Eddie & Joe Mine*, Simpson, Pa.
1942—Jeddo-Highland Coal Company, *Stockton Mine*, Stockton, Pa.
1943—Morgan Coal Mine, *Oregon Slope Mine*, Pittston, Pa.
1944—The Hudson Coal Company, *Miles Slope Mine*, Dickson City, Pa.
1945—Jermyn-Green Coal Company, *Butler Mine*, Pittston, Pa.
1946—Jermyn-Green Coal Company, *Butler Mine*, Pittston, Pa.
1947—Jermyn-Green Coal Company, *Butler Mine*, Pittston, Pa.
1948—Philadelphia and Reading Coal and Iron Company, *Hunter Tunnel Mine*, Ashland, Pa.
1949—Kehoe-Berge Coal Company, *Stevens Shaft Mine*, Exeter, Pa.
1950—The Hudson Coal Company, *Birdseye Mine*, Throop, Pa.
1951—Ploskonka Coal Company, *No. 5 Hill Mine*, Archbald, Pa.
1952—Philadelphia and Reading Coal and Iron Company, *Hunter Tunnel Mine*, Ashland, Pa.
1953—The Hudson Coal Company, *Coal Brook Mine*, Carbondale, Pa.
1954—Ploskonka Coal Company, *No. 5 Hill Mine*, Archbald, Pa.

BITUMINOUS-COAL

1925—United States Coal and Coke Company, *No. 6 Mine*, Gary, W. Va.
1926—United States Coal and Coke Company, *No. 6 Mine*, Gary, W. Va.
1927—United States Coal and Coke Company, *No. 2 Mine*, Gary, W. Va.
1928—United States Coal and Coke Company, *No. 4 Mine*, Gary, W. Va.
1929—DeBardeleben Coal Corporation, *Hull No. 33 Mine*, Dora, Ala.
1930—Penn Central Light and Power Company, *No. 1 Mine*, Coalmont, Pa.
1931—Phelps-Dodge Corporation, *Dawson No. 1 Mine*, Dawson, N. Mex.
1932—Electro Metallurgical Company, Alloy, W. Va.
1933—The Union Pacific Coal Company, *"B" Mine*, Superior, Wyo.
1934—The Union Pacific Coal Company, *"C" Mine*, Superior, Wyo.
1935—Elkhorn Piney Coal Company, *Ingram Branch Mine*, Ingram Branch, W. Va.
1936—The Koppers Coal Company, *Coxton Mine*, Coxton, Ky.
1937—The Union Pacific Coal Company, *"D" Mine*, Superior, Wyo.
1938—The Union Pacific Coal Company, *"B" Mine*, Superior, Wyo.
1939—The Union Pacific Coal Company, *Winton No. 1 Mine*, Winton, Wyo.
1940—The Union Pacific Coal Company, *Rock Springs No. 4 Mine*, Rock Springs, Wyo.
1941—Electro Metallurgical Company, *Alloy No. 2 Mine*, Alloy, W. Va.
1942—Knife River Coal Company, *Knife River Mine*, Beulah, N. Dak.
1943—The Union Pacific Coal Company, *"D" Mine*, Superior, Wyo.
1944—The Union Pacific Coal Company, *"D" Mine*, Superior, Wyo.
1945—Rockhill Coal Company, *Rockhill No. 5 Mine*, Robertsdale, Pa.
1946—Consolidated Coal Company, *Bankhead No. 2 Mine*, Bankhead, Ala.
1947—The Union Pacific Coal Company, *Winton No. 1 and 7½ Mine*, Winton, Wyo.
1948—The Union Pacific Coal Company, *Reliance No. 7 Mine*, Reliance, Wyo.
1949—The Union Pacific Coal Company, *Reliance No. 7 Mine*, Reliance, Wyo.
1950—The Union Pacific Coal Company, *Reliance No. 7 Mine*, Reliance, Wyo.
1951—The Union Pacific Coal Company, *Reliance No. 7 Mine*, Reliance, Wyo.
1952—Tennessee Coal and Iron Division, United States Steel Corporation, *Short Creek Mine*, Adamsville, Ala.
1953—The Union Pacific Coal Company, *Hanna No. 4-A Mine*, Hanna, Wyo.
1954—Alabama By-Products Corporation, *Labuco Mine*, Flat Creek, Ala.

METAL

1925—New York Mining Company, *New York Mine (zinc and lead)*, Picher, Okla.
1926—Federal Mining and Smelting Company, *Muncie Mine (zinc and lead)*, Baxter Springs, Kans.
1927—The Bristol Mining Company, *Bristol Mine (iron)*, Crystal Falls, Mich.
1928—Brule Mining Company, *Berkshire Mine (iron)*, Stambaugh, Mich.
1929—Brule Mining Company, *Berkshire Mine (iron)*, Stambaugh, Mich.
1930—Penn Iron Mining Company, *West Vulcan Mine*, Vulcan, Mich.
1931—Hanna Ore Mining Company, *Harold Mine*, Carson Lake, Minn.
1932—St. Joseph Lead Company, *Balmat Mine (lead, zinc, and pyrites)*, Balmat, N. Y.
1933—Tennessee Copper Company, *Burra Burra Mine*, Ducktown, Tenn.
1934—Penn Iron Mining Company, *East Vulcan Mine*, Vulcan, Mich.
1935—Vermillion Mining Company, *Zenith Mine (iron)*, Ely, Minn.
1936—Penn Iron Mining Company, *East Vulcan Mine*, Vulcan, Mich.
1937—M. A. Hanna Company, *Hiawatha No. 1 Mine (iron)*, Iron River, Mich.
1938—Odanah Iron Company, *Cary Mine (iron)*, Hurley, Wis.
1939—M. A. Hanna Company, *Bates Mine (iron)*, Iron River, Mich.
1940—Phelps-Dodge Corporation, *Humboldt Mine*, Morenci, Ariz.
1941—American Zinc Company of Tennessee, *Grasselli Mine (zinc sulphide)*, New Market, Tenn.
1942—Tennessee Copper Company, *Boyd Mine*, Ducktown, Tenn.
1943—Penn Iron Mining Company, *East Vulcan Mine*, Vulcan, Mich.
1944—Youngstown Mines Corporation, *Newport Mine (iron)*, Ironwood, Mich.
1945—James Mining Company, *James Mine (iron)*, Iron River, Mich.
1946—Tennessee Copper Company, *Burra Burra Copper Mine*, Ducktown, Tenn.
1947—Oliver Iron Mining Company, *Soudan Mine*, Soudan, Minn.
1948—Oliver Iron Mining Company, *Fraser Mine*, Fraser, Minn.
1949—American Zinc Company of Tennessee, *No. 2 Mine*, Mascot, Tenn.
1950—Republic Steel Corporation, *Tobin Mine*, Crystal Falls, Mich.
1951—Oliver Iron Mining Company, *Soudan Mine*, Soudan, Minn.
1952—The Verona Mining Company, Pickands Mather & Company, *Buck Mine*, Caspian, Mich.
1953—Tennessee Copper Company, *Calloway-Mary Mine*, Ducktown, Tenn.
1954—Pickands Mather & Company, *Zenith Mine*, Ely, Minn.

NONMETALLIC

1925—United States Gypsum Company, *Lower Gypsum Mine*, Gypsum, Ohio.

1926—The Beaver Products Company, Inc., *Grand Rapids Mine (gypsum)*, Grand Rapids, Mich.

1927—The Marquette Cement Manufacturing Company, *La Salle Mine (limestone)*, Oglesby, Ill.

1928—Alpha Portland Cement Company, *Ironton Mine (limestone)*, Ironton, Ohio.

1929—Retsof Mining Company, *Retsof Mine (rock salt)*, Retsof, N. Y.

1930—United States Gypsum Company, *Lower Gypsum Mine*, Gypsum, Ohio.

1931—Retsof Mining Company, *Retsof Mine (rock salt)*, Retsof, N. Y.

1932—Retsof Mining Company, *Retsof Mine (rock salt)*, Retsof, N. Y.

1933—Retsof Mining Company, *Retsof Mine (rock salt)*, Retsof, N. Y.

1934—The Marquette Cement Manufacturing Company, *La Salle Mine (limestone)*, Oglesby, Ill.

1935—Certain-teed Products Corporation, *Gypsum Mine*, Akron, N. Y.

1936—Tennessee Coal, Iron & Railroad Company, *No. 5 Mine (limestone)*, Bessemer, Ala.

1937—Tennessee Coal, Iron & Railroad Company, *No. 5 Mine (limestone)*, Bessemer, Ala.

1938—Avery Salt Company, Avery Island, La.

1939—Tennessee Coal, Iron & Railroad Company, *No. 5 Mine (limestone)*, Bessemer, Ala.

1940—Tennessee Coal, Iron & Railroad Company, *No. 5 Mine (limestone)*, Bessemer, Ala.

1941—The United States Gypsum Company, *No. 6 Mine (gypsum)*, Plasterco, Va.

1942—Alpha Portland Cement Company, *Ironton Mine (limestone)*, Ironton, Ohio.

1943—United States Gypsum Company, *No. 6 Mine (gypsum)*, Plasterco, Va.

1944—National Gypsum Company, *Akron Gypsum Mine*, Akron, N. Y.

1945—Freeport Brick Company, *Freeport Mine (clay)*, Freeport, Pa.

1946—Certain-teed Products Corporation, *Acme Gypsum Mine*, Acme, Texas.

1947—Tennessee Coal, Iron & Railroad Company, *No. 5 Mine (limestone)*, Bessemer, Ala.

1948—Alpha Portland Cement Company, *Ironton Mine*, Ironton, Ohio.

1949—National Gypsum Company, *Bellefonte Mine*, Bellefonte, Pa.

1950—Pittsburgh Plate Glass Company, *Barberton Limestone Mine*, Barberton, Ohio.

1951—International Salt Company, *Retsof Mine*, Retsof, N. Y.

1952—Michigan Limestone Division, United States Steel Corporation, *Annandale Mine (limestone)*, Boyers, Pa.

1953—Michigan Limestone Division, United States Steel Corporation, *Annandale Mine (limestone)*, Boyers, Pa.

1954—United States Gypsum Company, *No. 6 Mine (gypsum)*, Plasterco, Va.

OPEN-PIT AND QUARRIES

1925—North American Cement Corporation, *Security Quarry (limestone)*, Security, Md.

1926—North American Cement Corporation, *No. 5 and 6 Quarry (limestone)*, Martinsburg, W. Va.

1927—Lehigh Portland Cement Company, *Mitchell Quarry (limestone)*, Mitchell, Ind.

1928—Wakefield Iron Company, *Wakefield Open-pit Mine (iron)*, Wakefield, Mich.

1929—Michigan Limestone & Chemical Company, *Rogers City Quarry (limestone)*, Rogers City, Mich.

1930—Plymouth Mining Company, *Plymouth Open-pit (iron)*, Wakefield, Mich.

1931—Mahoning Ore & Steel Company, *Mahoning Open-pit Mine (iron)*, Hibbing, Minn.

1932—Michigan Limestone & Chemical Company, *Rogers City Quarry (limestone)*, Rogers City, Mich.

1933—Michigan Limestone & Chemical Company, *Rogers City Quarry (limestone)*, Rogers City, Mich.

1934—Michigan Limestone & Chemical Company, *Rogers City Quarry (limestone)*, Rogers City, Mich.

1935—Folsom State Prison, *Granite Quarry*, Folsom, Calif.

1936—Hanna Ore Mining Company, *Mesabi Chief Mine (iron)*, Keewatin, Minn.

1937—Illinois State Penitentiary, *Limestone Quarry*, Menard, Ill. (Separated into Individual Groups in 1938.)

OPEN-PIT

1938—Pickands Mather & Company, *Mahoning Mine (iron-ore)*, Hibbing, Minn.

1939—Pickands Mather & Company, *Scranton Mine (iron-ore)*, Hibbing, Minn.

1940—Pickands Mather & Company, *Mahoning Mine (iron-ore)*, Hibbing, Minn.

1941—Pickands Mather & Company, *Mahoning Mine (iron-ore)*, Hibbing, Minn.

1942—Pickands Mather & Company, *Mahoning Mine*, Hibbing, Minn.

1943—Pickands Mather & Company, *Danube Mine*, Bovey, Minn.

1944—Pickands Mather & Company, *Danube Mine*, Bovey, Minn.

1945—Pickands Mather & Company, *Mahoning Mine*, Hibbing, Minn.

1946—Oliver Iron Mining Company, *Rouchleau Iron-ore Pit*, Virginia, Minn.

1947—Pickands Mather & Company, *Mahoning Mine*, Hibbing, Minn.

1948—Oliver Iron Mining Company, *Spruce Open-cut Mine*, Eveleth, Minn.

1949—Pickands Mather & Company, *Embarrass Mine*, Biwabik, Minn.

1950—Pickands Mather & Company, *Embarrass Mine*, Biwabik, Minn.

1951—Oliver Iron Mining Company, *Mt. Iron Mine*, Mt. Iron, Minn.

1952—International Minerals and Chemical Corporation, *Noralyn Mine*, Bartow, Fla.

1953—Pickands Mather & Company, *Mahoning Mine*, Hibbing, Minn.

1954—Pickands Mather & Company, *Mahoning Mine*, Hibbing, Minn.

QUARRIES

1938—Inland Lime & Stone Company, *Port Inland Quarry (limestone)*, Manistique, Mich.

1939—Inland Lime & Stone Company, *Port Inland Quarry (limestone)*, Manistique, Mich.

1940—Tennessee Coal, Iron & Railroad Company, *Dolonah Quarry (dolomite)*, Bessemer, Ala.

1941—Tennessee Coal, Iron & Railroad Company, *Dolonah Quarry (dolomite)*, Bessemer, Ala.

1942—Bethlehem Steel Company, *Hanover Quarry*, Hanover, Pa.

1943—Wyandotte Chemicals Corporation, *Alpena Quarry*, Alpena, Mich.

1944—Basic Refractories, Inc., *Maple Grove Quarry (dolomite)*, Maple Grove, Ohio.

1945—Bethlehem Steel Company, *Bridgeport Quarry (limestone)*, Bridgeport, Pa.

1946—Bethlehem Steel Company, *Bridgeport Quarry (limestone)*, Bridgeport, Pa.

1947—Tennessee Coal, Iron & Railroad Company, *Dolonah Quarry (dolomite)*, Bessemer Ala.

1948—Bethlehem Steel Company, *Hanover Quarry*, Hanover, Pa.

1949—Tennessee Coal, Iron & Railroad Company, *Dolonah Quarry (dolomite)*, Bessemer, Ala.

1950—Michigan Limestone & Chemical Company, *Rogers City Quarry (limestone)*, Rogers City, Mich.

1951—Inland Lime & Stone Company, *Port Inland Quarry (limestone)*, Gulliver, Mich.

1952—Michigan Limestone Division, United States Steel Corporation, *Hillsville Quarry (limestone)*, Hillsville, Pa.

1953—Wyandotte Chemicals Corporation, *Alpena Quarry*, Alpena, Mich.

1954—Material Service Corporation, *Thornton Quarry (limestone)*, Thornton, Ill.

Awards of Certificates of Achievement in Safety

The rules of the competition provide for the award of Certificates of Achievement in Safety to each mine or quarry, other than the trophy winners, whose position in the contest was among the first four in their respective groups. Certificates are also awarded to each injury-free mine or quarry that worked 30,000 or more man-hours during the 12 consecutive months of each contest. The winners of Certificates of Achievement in Safety, in the National Safety Competition of 1954, are as follows:

ANTHRACITE MINES

St. Clair colliery, St. Clair, Schuylkill County, Pennsylvania, operated by The St. Clair Coal Company, worked 306,608 man-hours with 25 disabling injuries that caused 25 days of disability. The injury-severity rate was 2.084.

Olyphant Shaft mine, Olyphant, Lackawanna County, Pennsylvania, operated by The Hudson Coal Company, worked 607,982 man-hours with 42 disabling injuries that caused 1,358 days of disability. The injury-severity rate was 2.234.

Drifton No. 1 mines, Drifton, Luzerne County, Pennsylvania, operated by Jeddo-Highland Coal Company, worked 43,877 man-hours with 7 disabling injuries that caused 110 days of disability. The injury-severity rate was 2.507.

Potts colliery, Ashland, Schuylkill County, Pennsylvania, operated by The Philadelphia & Reading Coal & Iron Company, worked 510,419 man-hours with 23 disabling injuries that caused 1,340 days of disability. The injury-severity rate was 2.625.

BITUMINOUS-COAL MINES

Crescent No. 2 mine, Charleroi, Washington County, Pennsylvania, operated by Republic Steel Corporation, worked 110,455 man-hours without a disabling injury.

Thermal mine, Birmingham, Jefferson County, Alabama, operated by Alabama By-Products Corporation, worked 93,195 man-hours without a disabling injury.

Rock Springs No. 8 mine, Rock Springs, Sweetwater County, Wyoming, operated by The Union Pacific Coal Company, worked 77,694 man-hours without a disabling injury.

Brock No. 4 mine, Cassville, Monongalia County, West Virginia, operated by Christopher Coal Company, worked 64,053 man-hours without a disabling injury.

Hernshaw mine, Alloy, Fayette County, West Virginia, operated by Electro Metallurgical Company, Division of Union Carbide & Carbon Corporation, worked 54,919 man-hours without a disabling injury.

Hanna No. 4-A mine, Hanna, Carbon County, Wyoming, operated by The Union Pacific Coal Company, worked 40,154 man-hours without a disabling injury.

Patton Clay Mine No. 1, Patton, Cambria County, Pennsylvania, operated by Patton Clay Manufacturing Company, worked 35,180 man-hours without a disabling injury.

METAL MINES

Sunday Lake iron-ore mine, Wakefield, Gogebic County, Michigan, operated by Pickands Mather & Company (The Sunday Lake Iron Company), worked 443,504 man-hours without a disabling injury.

Albany iron-ore mine, Hibbing, St. Louis County, Minnesota, operated by Pickands Mather & Company (Crete Mining Company), worked 130,239 man-hours without a disabling injury.

Lawrence iron-ore mine, Crystal Falls, Iron County, Michigan, operated by Pickands Mather & Company (The Verona Mining Company), worked 49,604 man-hours without a disabling injury.

James iron-ore mine, Iron River, Iron County, Michigan, operated by Pickands Mather & Company (James Mining Company), worked 41,066 man-hours without a disabling injury.

Cayia iron-ore mine, Crystal Falls, Iron County, Michigan, operated by Inland Steel Company, worked 34,896 man-hours without a disabling injury.

NONMETALLIC MINES

Bell limestone mine, Bellefonte, Centre County, Pennsylvania, operated by Warner Company, Bellefonte Division, worked 246,689 man-hours without a disabling injury.

Ironton limestone mine, Ironton, Lawrence County, Ohio, operated by Alpha Portland Cement Company, worked 145,324 man-hours without a disabling injury.

Jefferson Island rock salt mine, Jefferson Island, Iberia County, Louisiana, operated by Jefferson Island Salt Company, worked 107,072 man-hours without a disabling injury.

Kimballton limestone mine, Kimballton, Giles County, Virginia, operated by The Standard Lime & Stone Company, worked 104,065 man-hours without a disabling injury.

Manheim limestone mine, Manheim, Preston County, West Virginia, operated by Alpha Portland Cement Company, worked 103,932 man-hours without a disabling injury.

Burlington fluorspar mine, Boulder, Boulder County, Colorado, operated by General Chemical Division of the Allied Chemical & Dye Corporation, worked 88,235 man-hours without a disabling injury.

Clarence Center gypsum rock mine, Clarence Center, Erie County, New York, operated by Universal Atlas Cement Company, worked 83,203 man-hours without a disabling injury.

Yellow Rock crushed stone mine, Yellow Rock, Lee County, Kentucky, operated by The Kentucky Stone Company, worked 54,476 man-hours without a disabling injury.

Jonathan limestone mine, Zanesville, Muskingum County, Ohio, operated by Pittsburgh Plate Glass Company, Columbia Cement Division, worked 42,433 man-hours without a disabling injury.

Morton rock salt mine, Grand Saline, Van Zandt County, Texas, operated by Morton Salt Company, worked 41,360 man-hours without a disabling injury.

Charmian roofing-granules mine, Charmian, Adams County, Pennsylvania, operated by The Funkhouser Company, worked 39,877 man-hours without a disabling injury.

Lompoc diatomaceous-earth mine, Lompoc, Santa Barbara County, California, operated by Johns-Manville Products Corporation, worked 39,007 man-hours without a disabling injury.

Fairmount slate mine, Fairmount, Bartow County, Georgia, operated by The Funkhouser Company, worked 35,100 man-hours without a disabling injury.

Tyrone crushed stone mine, Lawrenceburg, Anderson County, Kentucky, operated by The Kentucky Stone Company, worked 30,382 man-hours without a disabling injury.

OPEN-PIT MINES

Embarrass iron-ore mine, Biwabik, St. Louis County, Minnesota, operated by Pickands Mather & Company (Lake Mining Company), worked 483,692 man-hours without a disabling injury.

Mississippi Group iron-ore mine, Keewatin, Itasca County, Minnesota, operated by The M. A. Hanna Company (Hanna Ore Mining Company), worked 439,826 man-hours without a disabling injury.

Tioga No. 2 iron-ore mine, Grand Rapids, Itasca County, Minnesota, operated by Pickands Mather & Company (Western Mining Company), worked 326,561 man-hours without a disabling injury.

Sydney phosphate rock mine, Sydney, Hillsborough County, Florida, operated by American Cyanamid Company, worked 318,688 man-hours without a disabling injury.

West Hill iron-ore mine, Grand Rapids, Itasca County, Minnesota, operated by Pickands Mather & Company (Western Mining Company), worked 272,706 man-hours without a disabling injury.

Colonial bituminous-coal mine, Madisonville, Hopkins County, Kentucky, operated by The Colonial Coal Mining Company, worked 204,898 man-hours without a disabling injury.

Perry-Wyman iron-ore mine, Keewatin, Itasca County, Minnesota, operated by The M. A. Hanna Company (Hanna Coal & Ore Corporation), worked 200,852 man-hours without a disabling injury.

Section 18 iron-ore mine, Keewatin, St. Louis County, Minnesota, operated by The M. A. Hanna Company (Hanna Iron Ore Company), worked 200,327 man-hours without a disabling injury.

Enterprise iron-ore mine, Virginia, St. Louis County, Minnesota, operated by The M. A. Hanna Company (Hanna Ore Mining

Company), worked 199,106 man-hours without a disabling injury.

Babbitt taconite mine, Babbitt, St. Louis County, Minnesota, operated by Reserve Mining Company, worked 191,996 man-hours without a disabling injury.

Douglas iron-ore mine, Chisholm, St. Louis County, Minnesota, operated by The M. A. Hanna Company (Douglas Mining Company), worked 184,923 man-hours without a disabling injury.

Buckeye iron-ore mine, Coleraine, Itasca County, Minnesota, operated by The M. A. Hanna Company (Hanna Ore Mining Company), worked 170,485 man-hours without a disabling injury.

Bennett iron-ore mine, Keewatin, Itasca County, Minnesota, operated by Pickands Mather & Company (Bennett Mining Company), worked 168,405 man-hours without a disabling injury.

Gross-Marble open-pit iron-ore mine, Marble, Itasca County, Minnesota, operated by Oliver Iron Mining Division of the United States Steel Corporation, worked 140,838 man-hours without a disabling injury.

Lenzburg bituminous-coal mine, Lenzburg, St. Clair County, Illinois, operated by Seminole Coal Corporation, worked 136,655 man-hours without a disabling injury.

Mahnomen iron-ore mine, Crosby, Crow Wing County, Minnesota, operated by Pickands Mather & Company (Cuyuna Ore Company), worked 132,363 man-hours without a disabling injury.

Peace Valley phosphate mine, Bartow, Polk County, Florida, operated by International Minerals & Chemical Corporation, worked 128,532 man-hours without a disabling injury.

Longyear iron-ore mine, Hibbing, St. Louis County, Minnesota, operated by Jones & Laughlin Steel Corporation, Minnesota Ore Division, worked 121,253 man-hours without a disabling injury.

Sagamore iron-ore mine, Riverton, Crow Wing County, Minnesota, operated by Pickands Mather & Company (Sagamore Ore Mining Company), worked 120,520 man-hours without a disabling injury.

Corsica iron-ore mine, Elcor, St. Louis County, Minnesota, operated by Pickands Mather & Company (Corsica Iron Company), worked 120,317 man-hours without a disabling injury.

Plummer open-pit iron-ore mine, Taconite, Itasca County, Minnesota, operated by Oliver Iron Mining Division of the United States Steel Corporation, worked 115,550 man-hours without a disabling injury.

Gilbert open-pit iron-ore mine, Gilbert, St. Louis County, Minnesota, operated by Oliver Iron Mining Division of the United States Steel Corporation, worked 104,017 man-hours without a disabling injury.

Sweetwater gypsum mine, Sweetwater, Nolan County, Texas, operated by United States Gypsum Company, worked 96,588 man-hours without a disabling injury.

Achan phosphate mine, Mulberry, Polk County, Florida, operated by International Minerals & Chemical Corporation, worked 96,106 man-hours without a disabling injury.

Albany iron-ore mine, Hibbing, St. Louis County, Minnesota, operated by Pickands Mather & Company (Crete Mining Company), worked 92,548 man-hours without a disabling injury.

Lompoc diatomaceous-earth mine, Lompoc, Santa Barbara County, California, operated by Johns-Manville Products Corporation, worked 87,304 man-hours without a disabling injury.

Erie Preliminary Taconite Plant iron-ore mine, Aurora, St. Louis County, Minnesota, operated by Pickands Mather & Company (Erie Mining Company), worked 66,597 man-hours without a disabling injury.

Klondyke kaolin mine, McIntyre, Wilkinson County, Georgia, operated by Minerals & Chemicals Corporation of America, worked 64,279 man-hours without a disabling injury.

Columbia iron-ore mine, Virginia, St. Louis County, Minnesota, operated by Jones & Laughlin Steel Corporation, Minnesota Ore Division, worked 61,962 man-hours without a disabling injury.

Rabbit Lake iron-ore mine, Crosby, Crow Wing County, Minnesota, operated by Pickands Mather & Company (Youngstown Mines Corporation), worked 61,035 man-hours without a disabling injury.

Osage bituminous-coal mine, Steamboat Springs, Routt County, Colorado, operated by Osage Coal Company, worked 48,163 man-hours without a disabling injury.

Old Forge anthracite mine, Old Forge, Lackawanna County, Pennsylvania, operated by Lackawanna Mining & Construction Company, worked 47,764 man-hours without a disabling injury.

St. Clair anthracite colliery, St. Clair, Schuylkill County, Pennsylvania, operated by The St. Clair Coal Company, worked 43,274 man-hours without a disabling injury.

Rotan gypsum mine, Rotan, Fisher County, Texas, operated by National Gypsum Company, worked 38,968 man-hours without a disabling injury.

Addie olivine mine, Sylva, Jackson County, North Carolina, operated by Harbison-Walker Refractories Company, worked 36,936 man-hours without a disabling injury.

No. 13 Contour bituminous-coal mine, Gary, McDowell County, West Virginia, operated by United States Steel Corporation, worked 34,551 man-hours without a disabling injury.

Washington County kaolin mine, Oconee, Washington County, Georgia, operated by Minerals & Chemicals Corporation of America, worked 33,039 man-hours without a disabling injury.

QUARRIES

Hanover limestone quarry, Hanover, York County, Pennsylvania, operated by Bethlehem Quarry Company, worked 269,343 man-hours without a disabling injury.

Dolonah dolomite quarry, Bessemer, Jefferson County, Alabama, operated by Tennessee Coal & Iron Division of the United States Steel Corporation, worked 239,238 man-hours without a disabling injury.

Greystone crushed stone quarry, Henderson, Vance County, North Carolina, operated by Greystone Granite Quarries, Incorporated, worked 223,902 man-hours without a disabling injury.

Bailey Falls limestone quarry, Oglesby, LaSalle County, Illinois, operated by Marquette Cement Manufacturing Company, worked 199,165 man-hours without a disabling injury.

Plant No. 4 cement rock quarry, Nazareth, Northampton County, Pennsylvania, operated by Penn-Dixie Cement Corporation, worked 177,071 man-hours without a disabling injury.

Klondike limestone quarry, Oro Grande, San Bernardino County, California, operated by Riverside Cement Company, worked 168,120 man-hours without a disabling injury.

Naginey limestone quarry, Naginey, Mifflin County, Pennsylvania, operated by Bethlehem Quarry Company, worked 161,657 man-hours without a disabling injury.

Louisville limestone quarry, Louisville, Cass County, Nebraska, operated by Ash Grove Lime & Portland Cement Company, worked 159,148 man-hours without a disabling injury.

Oglesby limestone quarry, Oglesby, LaSalle County, Illinois, operated by Lehigh Portland Cement Company, worked 147,135 man-hours without a disabling injury.

Mason City limestone and shale quarry, Mason City, Cerro Gordo County, Iowa, operated by Lehigh Portland Cement Company, worked 137,009 man-hours without a disabling injury.

Fte. Bellefontaine limestone quarry, St. Louis, St. Louis County, Missouri, operated by Missouri Portland Cement Company, worked 135,390 man-hours without a disabling injury.

St. Stephens limestone quarry, St. Stephens, Washington County, Alabama, operated by Lone Star Cement Corporation, worked 131,471 man-hours without a disabling injury.

Lehigh Limestone and Brownstone Shale quarry, Mitchell and Brownstown, Lawrence and Jackson Counties, Indiana, operated by Lehigh Portland Cement Company, worked 125,686 man-hours without a disabling injury.

Dixon limestone quarry, Dixon, Lee County, Illinois, operated by Medusa Portland Cement Company, worked 124,551 man-hours without a disabling injury.

Martinsburg limestone quarry, Martinsburg, Berkeley County, West Virginia, operated by Jones & Laughlin Steel Corporation, Blair Limestone Division, worked 120,412 man-hours without a disabling injury.

North Branford No. 7 trap rock quarry, North Branford, New Haven County, Connecticut, operated by New Haven Trap Rock Company, worked 119,379 man-hours without a disabling injury.

Steelton limestone quarry, Steelton, Dauphin County, Pennsylvania, operated by Bethlehem Quarry Company, worked 116,146 man-hours without a disabling injury.

Lambertville crushed stone quarry, Lambertville, Hunterdon County, New Jersey, operated by Lambertville Quarry Company, worked 115,914 man-hours without a disabling injury.

Chanute limestone quarry, Chanute, Neosho County, Kansas, operated by Ash Grove Lime & Portland Cement Company, worked 109,717 man-hours without a disabling injury.

Lone Star limestone and shale quarry, Cloverdale, Botetourt County, Virginia, operated by Lone Star Cement Corporation, worked 108,253 man-hours without a disabling injury.

Thomaston limestone quarry, Thomaston, Knox County, Maine, operated by Dragon Cement Company, Incorporated, worked 104,767 man-hours without a disabling injury.

Galloway lime and rock quarry, Galloway, Greene County, Missouri, operated by Ash Grove Lime & Portland Cement Company, worked 104,632 man-hours without a disabling injury.

Fogelsville limestone and cement-stone quarry, Fogelsville, Lehigh County, Pennsylvania, operated by Lehigh Portland Cement Company, worked 103,565 man-hours without a disabling injury.

Stearns limestone quarry, Chicago, Cook County, Illinois, operated by Material Serv-

ice Corporation, worked 102,091 man-hours without a disabling injury.

Red Hill granite quarry, Charlottesville, Albermarle County, Virginia, operated by Superior Stone Company, worked 101,135 man-hours without a disabling injury.

Gay limestone and shale quarry, Fordwick, Augusta County, Virginia, operated by Lehigh Portland Cement Company, worked 100,063 man-hours without a disabling injury.

Jensen limestone quarry, Riverside, Riverside County, California, operated by Riverside Cement Company, worked 99,765 man-hours without a disabling injury.

Rock Hill traprock quarry, Quakertown, Bucks County, Pennsylvania, operated by The General Crushed Stone Company, worked 95,538 man-hours without a disabling injury.

Lawrence limestone and shale quarry, Ada, Pontotoc County, Oklahoma, operated by Ideal Cement Company, worked 93,007 man-hours without a disabling injury.

Nazareth cement rock quarry, Nazareth, Northampton County, Pennsylvania, operated by Lone Star Cement Corporation, worked 92,594 man-hours without a disabling injury.

Metaline Falls limestone and shale quarry, Metaline Falls, Pend Oreille County, Washington, operated by Lehigh Portland Cement Company, worked 92,201 man-hours without a disabling injury.

Bethlehem limestone quarry, Bethlehem, Northampton County, Pennsylvania, operated by Bethlehem Quarry Company, worked 91,632 man-hours without a disabling injury.

Woodleaf granite quarry, Woodleaf, Rowan County, North Carolina, operated by Superior Stone Company, worked 91,161 man-hours without a disabling injury.

Nazareth limestone quarry, Nazareth, Northampton County, Pennsylvania, operated by Nazareth Cement Company, worked 90,786 man-hours without a disabling injury.

Ormrod limestone and cement stone quarry, Ormrod, Lehigh County, Pennsylvania, operated by Lehigh Portland Cement Company, worked 89,961 man-hours without a disabling injury.

LaSalle limestone quarry, LaSalle, LaSalle County, Illinois, operated by Alpha Portland Cement Company, worked 89,473 man-hours without a disabling injury.

Gibsonburg limestone quarry, Gibsonburg, Sandusky County, Ohio, operated by The Kelley Island Company, worked 88,500 man-hours without a disabling injury.

No. 7 limestone and cement rock quarry, West Coplay, Lehigh County, Pennsylvania, operated by Coplay Cement Manufacturing Company, worked 87,645 man-hours without a disabling injury.

Earlham limestone quarry, Earlham, Madison County, Iowa, operated by Marquette Cement Manufacturing Company, worked 87,294 man-hours without a disabling injury.

Clinchfield No. 2 limestone quarry, Clinchfield, Houston County, Georgia, operated by Penn-Dixie Cement Corporation, worked 86,099 man-hours without a disabling injury.

Jordanville limestone quarry, Jordanville, Herkimer County, New York, operated by The General Crushed Stone Company, worked 84,730 man-hours without a disabling injury.

Martins Creek limestone quarry, Martins Creek, Northampton County, Pennsylvania, operated by Alpha Portland Cement Company, worked 82,911 man-hours without a disabling injury.

Bonner Springs limestone quarry, Bonner Springs, Wyandotte County, Kansas, operated by Lone Star Cement Corporation, worked 82,645 man-hours without a disabling injury.

York limestone quarry, York, York County, Pennsylvania, operated by National Gypsum Company, worked 82,128 man-hours without a disabling injury.

Kingston traprock quarry, Kingston, Somerset County, New Jersey, operated by Kingston Bituminous Products Company, worked 81,476 man-hours without a disabling injury.

Sylvania limestone quarry, Sylvania, Lucas County, Ohio, operated by Medusa Portland Cement Company, worked 80,324 man-hours without a disabling injury.

Romeo Rock limestone quarry, Lockport, Will County, Illinois, operated by Material Service Corporation, worked 79,593 man-hours without a disabling injury.

Gibsonburg lime quarry, Gibsonburg, Sandusky County, Ohio, operated by National Gypsum Company, worked 78,273 man-hours without a disabling injury.

Iola limestone and shale quarry, Iola, Allen County, Kansas, operated by Lehigh Portland Cement Company, worked 77,025 man-hours without a disabling injury.

Ohio dolomite quarry, Millersville, Sandusky County, Ohio, operated by The J. E Baker Company, worked 76,960 man-hours without a disabling injury.

Greencastle limestone quarry, Greencastle, Putnam County, Indiana, operated by Lone Star Cement Corporation, worked 75,173 man-hours without a disabling injury.

Fairborn limestone quarry, Fairborn, Greene County, Ohio, operated by Universal Atlas Cement Company, worked 73,634 man-hours without a disabling injury.

Northampton cement rock quarry, Northampton, Northampton County, Pennsylvania, operated by Universal Atlas Cement Company, worked 73,545 man-hours without a disabling injury.

Diamond limestone quarry, Middle Branch, Stark County, Ohio, operated by The Diamond Portland Cement Company, worked 70,876 man-hours without a disabling injury.

Reliance "B" cement rock quarry, Egypt, Lehigh County, Pennsylvania, operated by Giant Portland Cement Company, worked 69,953 man-hours without a disabling injury.

Dallas limestone and shale quarry, Dallas, Dallas County, Texas, operated by Lone Star Cement Corporation, worked 69,930 man-hours without a disabling injury.

Watertown limestone quarry, Watertown, Jefferson County, New York, operated by The General Crushed Stone Company, worked 69,750 man-hours without a disabling injury.

Delta slate quarry, Delta, York County, Pennsylvania, operated by The Funkhouser Company, worked 68,526 man-hours without a disabling injury.

Stockertown limestone quarry, Stockertown, Northampton County, Pennsylvania, operated by Hercules Cement Corporation, worked 68,409 man-hours without a disabling injury.

National City gypsum rock quarry, National City, Iosco County, Michigan, operated by National Gypsum Company, worked 67,730 man-hours without a disabling injury.

Wampum limestone quarry, Wampum, Lawrence County, Pennsylvania, operated by Medusa Portland Cement Company, worked 67,648 man-hours without a disabling injury.

Margerum asphaltic limestone quarry, Margerum, Colbert County, Alabama, operated by Alabama Asphaltic Limestone Company, worked 66,722 man-hours without a disabling injury.

Greencastle No. 2 limestone quarry, Greencastle, Putnam County, Indiana, operated by The Ohio & Indiana Stone Corporation, worked 65,560 man-hours without a disabling injury.

Leeds limestone, shale and sandstone quarries, Leeds, Jefferson County, Alabama, operated by Universal Atlas Cement Company, worked 65,538 man-hours without a disabling injury.

Bellevue limestone quarry, Bellevue, Sandusky County, Ohio, operated by The France Stone Company, worked 65,438 man-hours without a disabling injury.

Buffalo shale quarry, Buffalo, Erie County, New York, operated by Lehigh Portland Cement Company, worked 65,264 man-hours without a disabling injury.

New Braunfels limestone quarry, New Braunfels, Comal County, Texas, operated by United States Gypsum Company, worked 64,947 man-hours without a disabling injury.

Inwood limestone quarry, Inwood, Berkeley County, West Virginia, operated by The J. E. Baker Company, worked 64,939 man-hours without a disabling injury.

Independence limestone quarry, Independence, Montgomery County, Kansas, operated by Universal Atlas Cement Company, worked 63,605 man-hours without a disabling injury.

Hudson limestone and shale quarry, Hudson, Columbia County, New York, operated by Universal Atlas Cement Company, worked 61,920 man-hours without a disabling injury.

Portland limestone quarry, Portland, Fremont County, Colorado, operated by Ideal Cement Company, worked 60,949 man-hours without a disabling injury.

Birmingham limestone quarry, Birmingham, Jefferson County, Alabama, operated by Lone Star Cement Corporation, worked 60,180 man-hours without a disabling injury.

Union Bridge limestone quarry, Union Bridge, Frederick and Carroll Counties, Maryland, operated by Lehigh Portland Cement Company, worked 59,493 man-hours without a disabling injury.

Union Furnace limestone quarry, Tyrone, Huntingdon County, Pennsylvania, operated by Warner Company, Bellefonte Division, worked 58,707 man-hours without a disabling injury.

Davenport limestone quarry, Buffalo Scott County, Iowa, operated by Dewey Portland Cement Company, worked 58,143 man-hours without a disabling injury.

Fairmount limestone quarry, Fairmount, Vermilion County, Illinois, operated by Material Service Corporation, worked 58,113 man-hours without a disabling injury.

Trident limestone quarry, Trident, Gallatin County, Montana, operated by Ideal Cement Company, worked 58,019 man-hours without a disabling injury.

Granite Canon ballast quarry, Granite Canon, Laramie County, Wyoming, operated by Morrison-Knudsen Company, Incorporated, worked 57,280 man-hours without a disabling injury.

Cedar Hollow lime quarry, Devault, Chester County, Pennsylvania, operated by Warner Company, worked 56,848 man-hours without a disabling injury.

Silica limestone quarry, Sylvania, Lucas County, Ohio, operated by Toledo Stone & Glass Sand Company, worked 55,889 man-hours without a disabling injury.

(Continued on page 124)

DYNAMITE DEEPENS A QUARRY FLOOR

A blast of 22,900 pounds of dynamite, loaded into holes in the floor of a North Carolina granite quarry, established a new working face 30 ft. high

KENNETH N. BAKER*

EXPENSIVE STRIPPING: Before blasts are made in the quarry face, overburden of red, sandy clay, 40 ft. deep, is excavated by a Northwest 2¼-cu. yd. dragline and hauled away. Establishing a new working face in the quarry floor will eliminate this expensive stripping job.

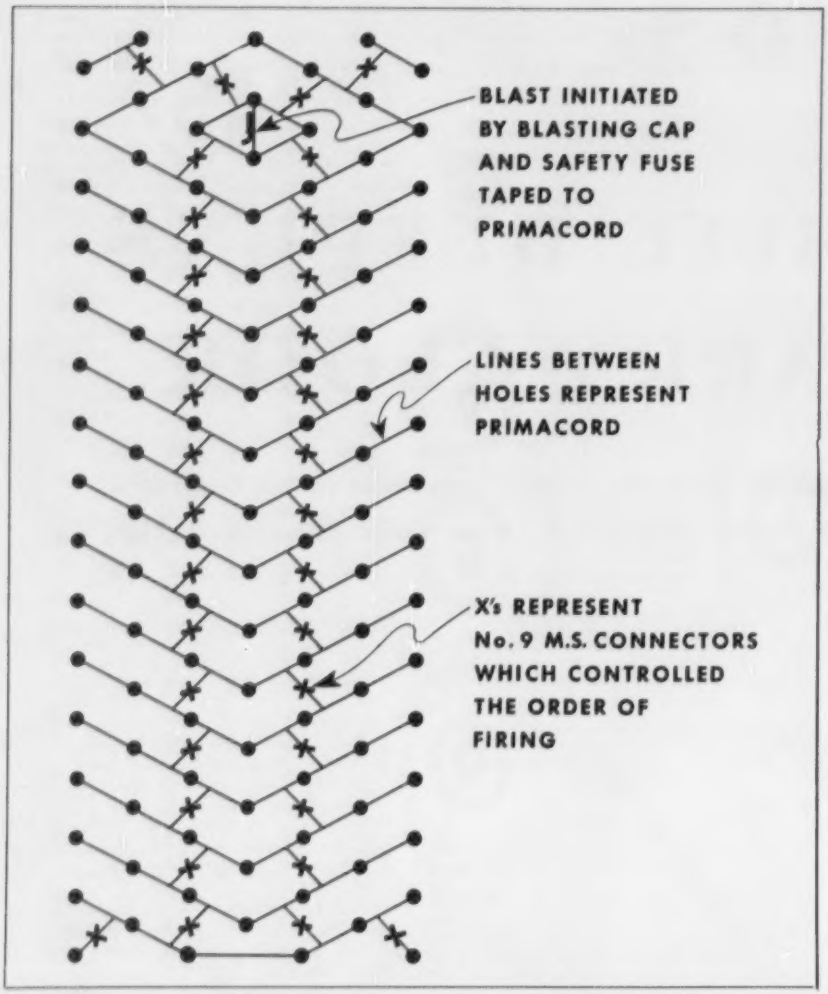
For reasons of economy of operations, Bryan Rock and Sand Company of Raleigh, North Carolina, decided to deepen the floor of the granite quarry at its Neverson Plant. The Neverson Plant property is located in Bailey, North Carolina, 30 miles east of Raleigh, on the Norfolk and Southern Railroad.

The rock formation in the quarry is a hard, blocky granite. It is covered with 40 ft. of red, sandy clay overburden that has to be removed by stripping before the rock is drilled and blasted. Successive blasts through the years have moved the quarry face back until the costs of truck haulage to the crusher have become a major item of operating expense. Because of the steady increase in the costs of these two operating items, the company management decided to deepen the pit and establish a new working face by firing blasts of dynamite in the quarry floor.

Drilling

The first blast in the quarry floor involved the drilling of 112 holes, divided into seven rows of 16 holes each, with a square spacing of 10 by 10 ft. An Ingersoll-Rand Quarrymaster drill

*Hercules Powder Company
Wilmington 99, Delaware



PATTERN OF BLAST HOLES: The first blast in the quarry floor involved the drilling of 112 holes, each 6 in. in diameter and 42 ft. deep. The holes were divided into seven rows of 16 holes each, with a square spacing of 10 by 10 ft. The area of the blast was rectangular in shape, 150 ft. long and 60 ft. wide.

equipped with 6-in. bits put down the holes to a depth of 42 ft. The area of the blast was rectangular in shape, 150 ft. long and 60 ft. wide.

Loading the Holes

After drilling was completed, each hole was loaded with an average charge of 250 lb. of a Hercules desensitized semigelatin of 60 per cent strength. The dynamite was packed into 5-in. by 25-lb. 23G containers, with lowering bails of plastic tape attached to the top of each cartridge. An XC-45 booster – required for initiating the detonation of desensitized explosives – was laced with Reinforced Primacord* and inserted into a punched hole in the first cartridge loaded into each hole. Each loaded hole was stemmed with 18 to 20 ft. of minus ¼-in. crushed granite.

The presence of water in the blast holes required the use of a material that would sink in water, and, at the same time, give a maximum of compaction. Because of the proximity of the plant and maintenance buildings, controlled blasting was of primary importance. Some of the buildings were only 90 ft. away.

*Reg. U. S. Pat. Off. by The Ensign-Bickford Company

THE DRILL: An Ingersoll-Rand Quarrymaster unit has been placed in position to drill vertical holes 6 in. in diameter preparatory to firing the second primary blast in the quarry floor.

ESTABLISHING NEW FACE: After the first blast in the quarry floor, a 3½-cu. yd. Lima shovel loads the broken granite into Euclid trucks for a short haul to the primary crusher.

The Blast

The holes were connected with trunk lines of Primacord and delayed firing was accomplished with No. 9 M.S. connectors, as shown in an accompanying diagram. The firing of the Primacord was initiated with a blasting cap and safety fuse. The explosives loading ratio was 1.7 tons of rock in the solid per 1 lb. of explosive, or 1.3 lb. of explosive per solid cubic yard.

The blast was well executed, with the granite heaving and pulling toward the opening holes. Fragmentation was excellent. As planned, the new working face established was 30 ft. plus.

The product of the Neverson Plant is used commercially for highway construction, as railroad ballast, topping for highway asphalt, as riprap, and for filter treatment and concrete blocks.

Besides the Neverson Plant, Bryan Rock and Sand Company operates granite quarries at Rolesville and West Raleigh in North Carolina, and at Rawlings, Virginia. D. T. Bailey, with headquarters in Raleigh, North Carolina, is general manager of the company. James E. Raybon is superintendent of the Neverson Plant.

AT THE PLANT: Trucks loaded with blasted granite from the Neverson quarry dump their contents into a 48 by 60-in. Allis-Chalmers primary crusher, the first step in reducing and sizing the stone for various commercial uses.

FINISHED PRODUCT: Bryan Rock and Sand Company ships its finished product from the Neverson Plant for highway construction, as railroad ballast, topping for highway asphalt, as riprap, and for filter treatment and concrete blocks.

Awards of Certificates

(Continued from page 120)

Birmingham limestone quarry, Birmingham, Jefferson County, Alabama, operated by Alpha Portland Cement Company, worked 54,984 man-hours without a disabling injury.

Winterset limestone quarry, Winterset, Madison County, Iowa, operated by Penn-Dixie Cement Corporation, worked 54,355 man-hours without a disabling injury.

Southwestern limestone quarry, Fairborn, Greene County, Ohio, operated by Southwestern Portland Cement Company, worked 54,286 man-hours without a disabling injury.

Blue Mount traprock quarry, White Hall, Baltimore County, Maryland, operated by The J. E. Baker Company, worked 53,841 man-hours without a disabling injury.

National Portland cement rock quarry, Bethlehem, Northampton County, Pennsylvania, operated by National Portland Cement Company, worked 53,760 man-hours without a disabling injury.

Bloomville limestone quarry, Bloomville, Seneca County, Ohio, operated by The France Company, worked 53,405 man-hours without a disabling injury.

Marquette limestone quarry, Cape Girardeau, Cape Girardeau County, Missouri, operated by Marquette Cement Manufacturing Company worked 53,246 man-hours without a disabling injury.

Maryneal limestone quarry, Maryneal, Nolan County, Texas, operated by Lone Star Cement Corporation, worked 52,630 man-hours without a disabling injury.

Frazier limestone quarry, Zanesville, Muskingum County, Ohio, operated by Pittsburgh Plate Glass Company, Columbia Cement Division, worked 52,481 man-hours without a disabling injury.

York dolomite quarry, York, York County, Pennsylvania, operated by The J. E. Baker Company, worked 51,792 man-hours without a disabling injury.

St. Louis limestone quarry, St. Louis, St. Louis County, Missouri, operated by Alpha Portland Cement Company, worked 50,734 man-hours without a disabling injury.

Plant No. 3 limestone quarry, Richard City, Marion County, Tennessee, operated by Penn-Dixie Cement Corporation, worked 50,165 man-hours without a disabling injury.

Alsen limestone quarry, Alsen, Greene County, New York, operated by Lehigh Portland Cement Company, worked 47,336 man-hours without a disabling injury.

Cape Girardeau limestone quarry, Cape Girardeau, Cape Girardeau County, Missouri, operated by The Federal Materials Company, worked 46,784 man-hours without a disabling injury.

Hudson limestone quarry, Hudson, Columbia County, New York, operated by Lone Star Cement Corporation, worked 46,400 man-hours without a disabling injury.

Prospect Stone Plant No. 6 limestone quarry, Prospect, Oneida County, New York, operated by Eastern Rock Products, Incorporated, worked 46,213 man-hours without a disabling injury.

Luckey limestone quarry, Luckey, Wood County, Ohio, operated by National Gypsum Company, worked 43,562 man-hours without a disabling injury.

Natividad dolomite quarry, Natividad, Monterey County, California, operated by Kaiser Aluminum & Chemical Corporation, worked 42,432 man-hours without a disabling injury.

Montgomeryville building and crushed stone quarry, Montgomeryville, Montgomery County, Pennsylvania, operated by Montgomery Stone Company, worked 40,900 man-hours without a disabling injury.

Boettcher limestone quarry, LaPorte, Larimer County, Colorado, operated by Ideal Cement Company, worked 39,760 man-hours without a disabling injury.

Knoxville lime quarry, Knoxville, Knox County, Tennessee, operated by The Standard Lime & Stone Company, worked 39,008 man-hours without a disabling injury.

Martha limestone quarry, Lebanon, Wilson County, Tennessee, operated by Marquette Cement Manufacturing Company, worked 34,480 man-hours without a disabling injury.

Waco limestone quarry, Waco, McLennan County, Texas, operated by Universal Atlas Cement Company, worked 31,525 man-hours without a disabling injury.

Phillipsburg dolomite quarry, Phillipsburg, Montgomery County, Ohio, operated by The Laura Gravel & Stone Company, worked 31,510 man-hours without a disabling injury.

San Juan limestone quarry, San Juan Bautista, San Benito County, California, operated by Ideal Cement Company, worked 31,235 man-hours without a disabling injury.

Medusa limestone quarry, York, York County, Pennsylvania, operated by Medusa Portland Cement Company, worked 31,164 man-hours without a disabling injury.

VIBRATION TROUBLES?

To Explosives Users in the Pittsburgh Area and Surroundings:
We announce the opening of a new branch location in the Pittsburgh area under management of Philip R. Berger

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INDUSTRIAL SEISMOLOGY

VIBRATION SURVEYS—BLASTING EFFECTS ANALYSIS

•

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CONSULTING ENGINEER

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•

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30 YEARS' EXPERIENCE IN ANALYSIS OF EXPLOSIVES EFFECTS

INTERNATIONAL BACKGROUND

Here's your Blaster—

Your Blaster is well off the rock pile. He's all set to shoot the big chunks *wherever they lie.* Each hole is primed with fuse and cap, and the fuse has been hooked up with *Quarrycord.*

Ensign-Bickford Quarrycord is a flexible, water-resistant cord which burns with an external flame at the rate of about one foot per second. A connector, crimped on the free end of each fuse, provides a positive connection for the Quarrycord.

Notice that the hook-up employs cross connections at fairly close intervals. This is done to get the fire there faster — to make sure that each safety fuse is ignited in time to *burn below the collar of the hole before the first charges fire.*

Now you can do your Secondary Blasting in *one* operation without causing one big blast. You can fire when ready, from a point of easy retreat. Quarrycord is not affected by stray electrical currents.

Ensign-Bickford Quarrycord is packed on spools in 500 ft. lengths. See your Explosives Supplier, or write to

THE ENSIGN-BICKFORD COMPANY

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Manufacturers of Primacord® Detonating Fuse, Safety Fuse, Ignitacord®, Blasting Accessories.

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Quarrycord

for lighting Safety Fuse in Secondary Blasting

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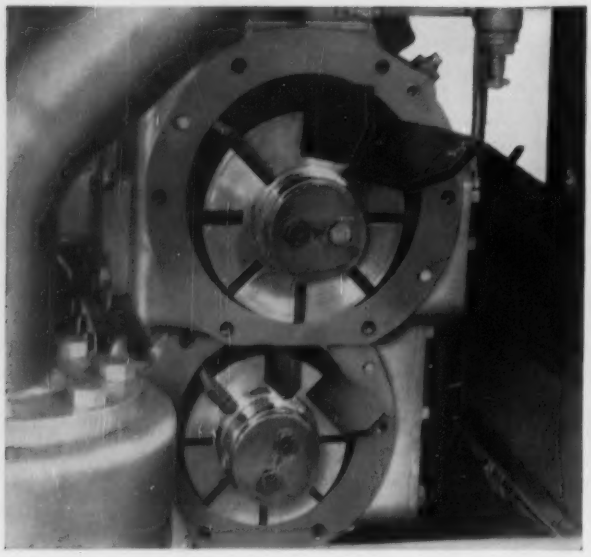

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an outstanding advantage of the new water-cooled GARDNER-DENVER ROTARY 600

In minutes only . . . your own compressor man removes all compressor blades for inspection or replacement.
Remove a dozen cap screws . . . off come the end plates . . . out slide the blades . . . and bearing assemblies are not disturbed. That's super simplicity . . . engineered by Gardner-Denver to keep the new rotary 600 delivering air when you need it.

No Other Rotary Has All These Features—

Automatic water-cooling maintains best operating temperature in any weather.

Water Circulation system warms up compressor oil before compressor turns . . . eliminates dry starts.

Finger-tip hydro-shift clutch disengages compressor load for easy engine starting in sub-zero weather.

Metered oil flow assures positive compressor lubrication, sealing and cooling under all operating conditions.

Moisture eliminator removes condensation from oil system . . . prevents oil contamination and freeze-up dangers.

Thriftmeter — Gardner-Denver's simple, automatic speed control . . . saves fuel . . . saves wear and tear on engine and compressor.

Inspection covers provide ready access to all vital parts . . . help you put field maintenance on a routine basis.

Write for additional information.

GARDNER-DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada) Ltd., 14 Curity Avenue, Toronto 16, Ontario

FOUR ROUNDS PER SHIFT!

Peak production on 8-ft diameter bore under Niagara River is achieved by experienced crew of Herbert F. Darling, Williamsville, N. Y. contractor. 5,800-ft tunnel will carry Niagara water to town of Tonawanda. Swing shift has drilled, shot and mucked four rounds in 7 hours! Four man crew, with two JR-38As and Carset Jackbits, drills and loads 23-hole, 6-ft round in 55 min. Super on job credits fast drilling to use of Ingersoll-Rand JR-38A Jackdrills—lightweight and easy to handle.

Ingersoll-Rand
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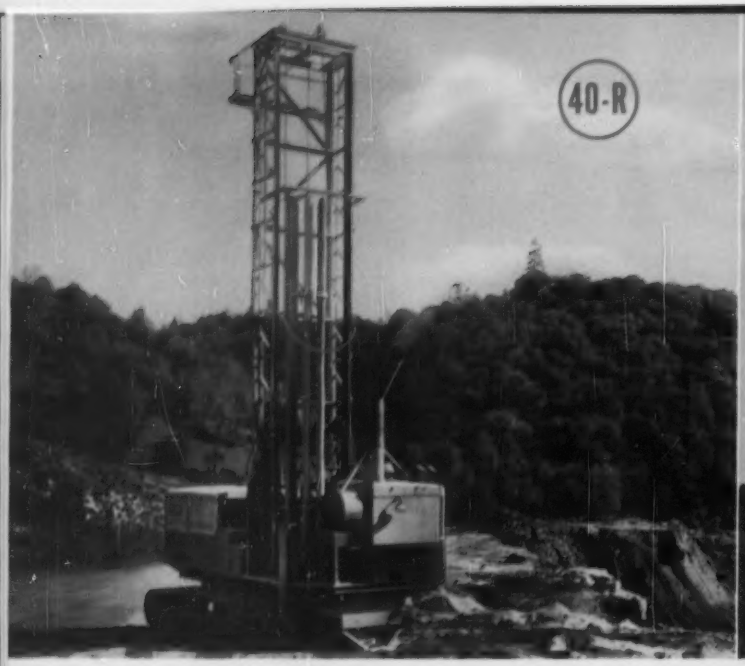
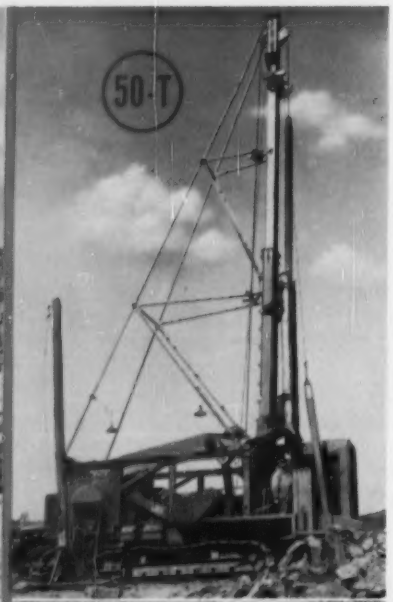


A Size And Type To Meet Your Drilling Needs



WHATEVER your blast hole drilling needs may be, Bucyrus-Erie has *the machine to meet them.*

For small and medium-sized quarries, cement plants, and construction projects, look into the churn-type 22-T and 27-T machines. They drill 6- to 6⅝-in. holes, are ideal to cut down the number of holes drilled and still give you the same amount of material broken.

For larger scale quarry and mine operations, Bucyrus-Erie offers you a choice of two churn-type and two rotary models. To drill large-diameter holes even in the toughest formations, there's the 29-T for 6- to 9-in. holes; the 50-T for 9- to 12-in. holes. For drilling these large-diameter holes at astounding rates of speed, there's the 50-R rotary for 9⅞- to 12¼-in. holes; the new 40-R for 6¾- to 9-in. holes.

Featuring Ward Leonard electric control on rotation of drill pipe, hydraulically powered down pressure on the drill bit, and air-blast cleaning, these rotary machines are setting new high production records in an ever increasing number of quarries, strip mines, and open-cut mines.

Choose the Bucyrus-Erie drill model that fits your work — then write for the complete picture-story. 22855C

BUCYRUS-ERIE COMPANY

South Milwaukee, Wisconsin

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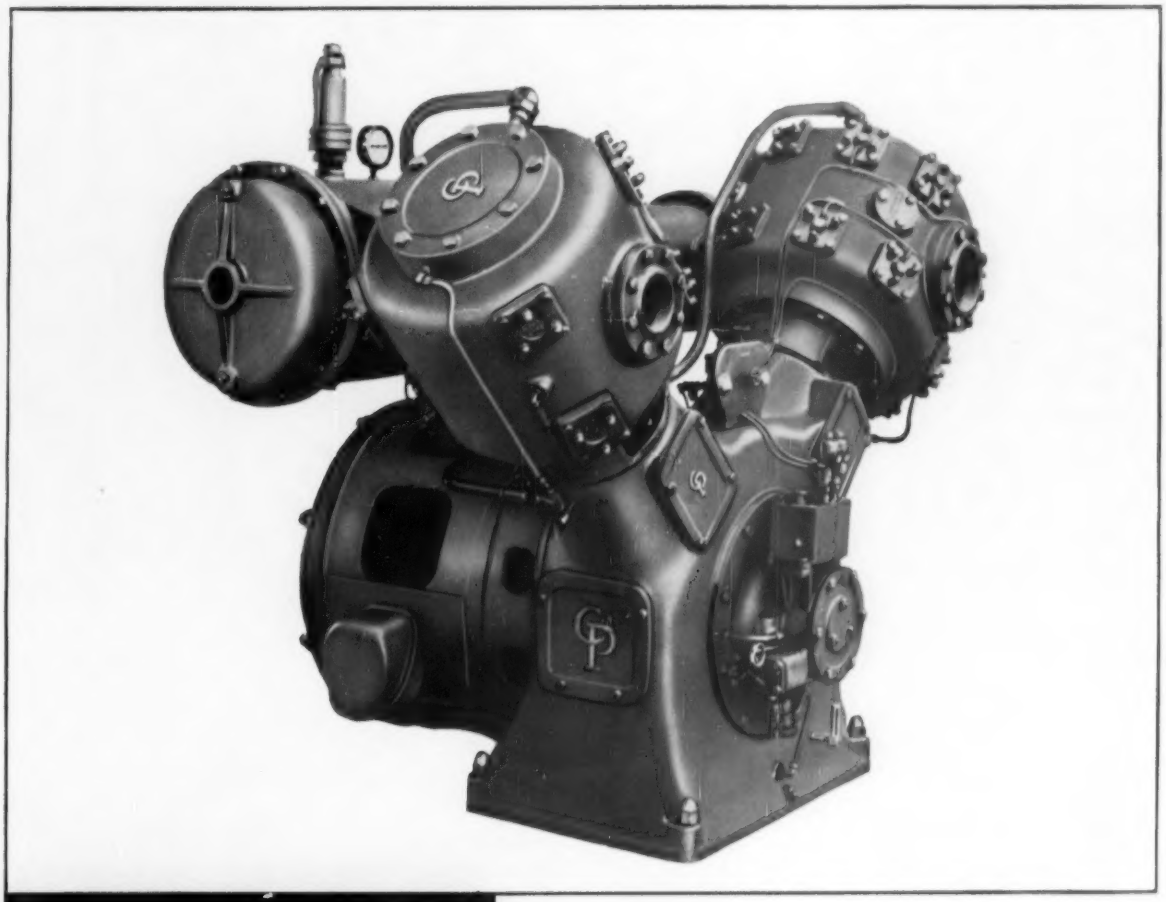
75 Years of Service
To Men Who Shape The Earth



for the most in a Compressor

IN THE LEAST SPACE

The Class "Y" compressor offers everything a good compressor should have for heavy duty service: high overall efficiency, long life with minimum maintenance; smooth, quiet operation, accessibility and simplicity, compactness and ease of installation. With one-piece frame, it is shipped intact, including a flange-mounted motor—truly a "package" type unit. Built in sizes 75 to 250 H.P., it is available in single and multi-stage designs for pressures up to 5000 pounds, with belted, coupled or flange-mounted motor drive.

Simplate Valves, efficient and easy-to-clean shell-and-tube intercooler, multistep capacity regulation, roller main and precision type connecting rod bearings are some of the reasons for the big compressor performance of these medium size machines.

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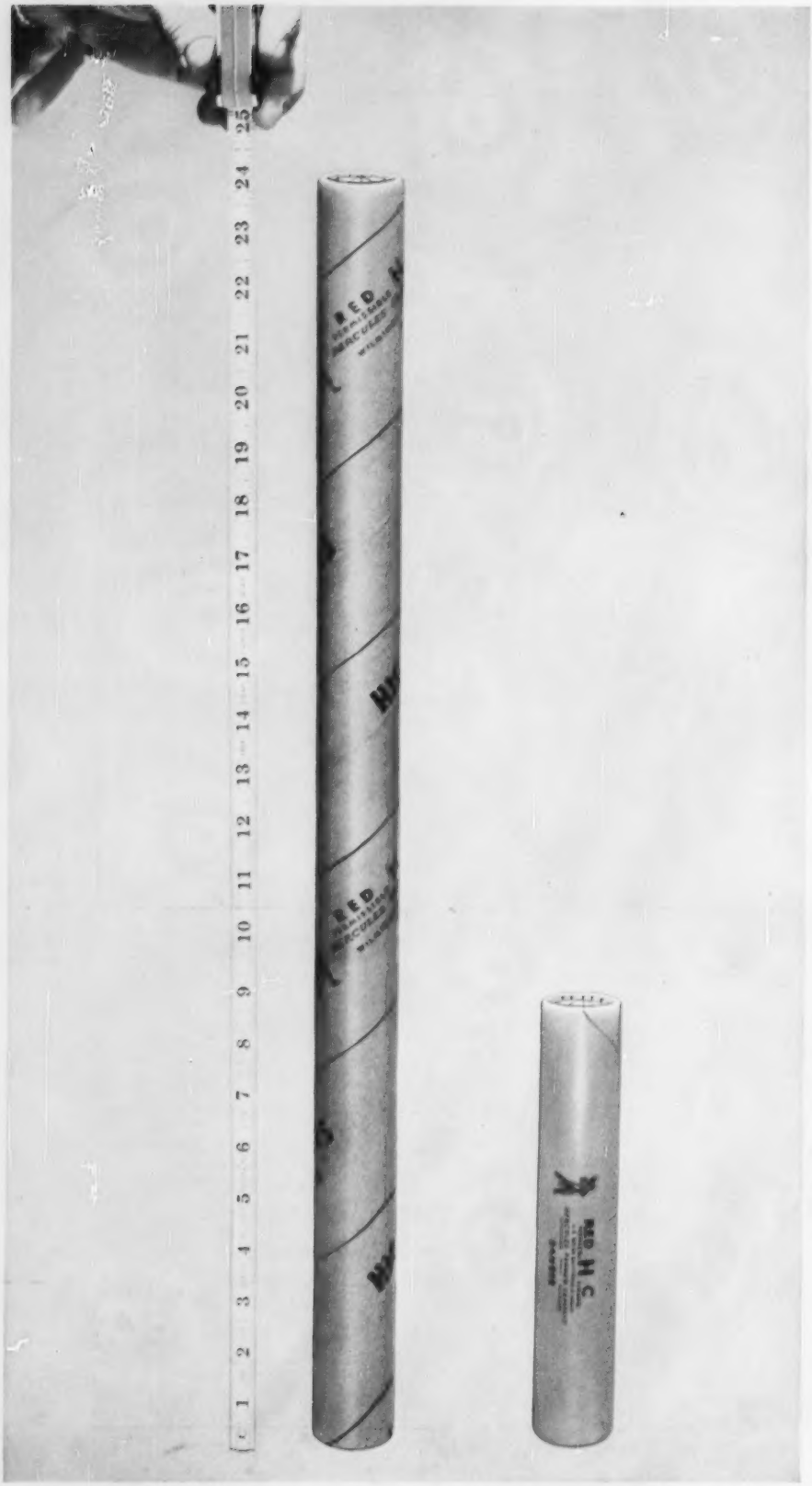
Chicago Pneumatic *8 East 44th Street, New York 17, N. Y.*

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



THE LONG AND THE SHORT OF IT . . . Here is a new Hercules "King-Size" permissible cartridge—24 inches in length—shown alongside the same grade in the conventional 8-inch size.

NOW... "KING-SIZE" PERMISSIBLES

Hercules permissible powders packed in "King-Size" cartridges are now available for use in coal mines. Field tests of these new "King-Size" cartridges show that they have many advantages, some of which are:

- **A continuous column of permissible powder in bore holes minimizes misfires and reduces the hazard of unshot powder in the coal.**
- **Predetermined cartridge weights effect economies in the powder consumption.**
- **Uniformity in loading produces uniform breakage.**

Hercules "King-Size" cartridges are supplied in most permissible grades, in lengths from 12 to 24 inches and in diameters of 1¼ to 2 inches.

Our representatives are ready to discuss your explosives needs and to give more information on how the new "King-Size" cartridges can do more work for you at lower cost.

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